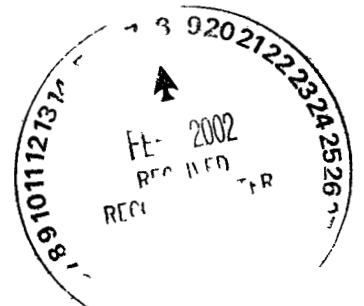


You may call either Christine or me if you have any questions comments or suggestions concerning the RFCA Stakeholder Focus Group or the upcoming meeting

Sincerely

Handwritten signature of C Reed Hodgins in cursive, followed by a large slanted 'cb'.

C Reed Hodgins CCM
Facilitator / Process Manager



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RFCA Stakeholder Focus Group Attachment A

Title	February 20, 2002 Meeting Agenda
Date	February 8 2002
Authors	Reed Hodgins
Phone Number	(303) 428 5670
Email Address	<u>cbennett@alphatrac.com</u>

RFCA Stakeholder Focus Group Attachment B

Title	February 6 2002 Meeting Handouts <ul style="list-style-type: none">• RSALs Task 3 and Windtunnel Review Comments• Summary of End State Options - Surface Contamination• RFETS End State Options Holistic Summary• Papers from LeRoy Moore Rocky Mountain Peace & Justice Center Excess Cancers among Workers Exposed to Plutonium on the Job at Rocky Flats Risk from Plutonium in the Environment at Rocky Flats From <i>Closing the Circle on the Splitting of the Atom</i> (Washington DC U S Department of energy January 1995) page 38 The Evolution of Health Protection Standards for Nuclear Workers from the <i>Health Physics The Radiation Safety Journal</i> Public Involvement in Science and Decision Making? Submitted by Steve Tarlton and from the RAC report No 5 CDPHE RFP 1998 FINAL(Rev 2)(2000) Assessing Risks of Exposure to Plutonium Organ doses from one day of exposure to an air concentration of 1 Bq/m³
Date	February 8 2002
Authors	Reed Hodgins
Phone Number	(303) 428 5670
Email Address	<u>cbennett@alphatrac.com</u>

General Comments	
1	A key question is how much saltation size soil and burn debris of similar size were mobile and would move downwind and generate additional PM 10 by breakage of the moving material and abrasion of the downwind surface at high wind speeds? The tunnel test results do not report threshold velocities for coarse particles nor measurements of the amount of these particles and burn debris removed during testing. The implicit assumption in the wind tunnel test protocol was that incoming saltating soil and debris particles would be absent and only wind would affect the test surface during a wind storm
2	The test wind tunnels are probably too small in cross section and too short in length to accurately simulate atmospheric boundary layer flow over a significant portion of the test section on the rough test surfaces at Rocky Flats. Second some of the roughness elements were large relative to the tunnel size thus creating blockage effects. There are also edge effects where the tunnel sides meet the uneven ground surface
3	Another difference between the wind tunnel and atmospheric winds is that the latter vary in the wind direction about the mean direction. The directional fluctuations during a storm would likely increase total PM 10 discharge a few percent above that measured from the straight winds in the wind tunnel
4	Because the soil [at Rocky Flats - ed] is a limited source some period of time may be needed between wind events to replenish the loose particles through weathering deposition or disturbance processes. The limited source concept means that when considering potential emissions on successive days following a wind storm the present tunnel results would tend to overestimate the PM 10 available for resuspension
Specific Comments	
5	The selection process for the test plots was not described but there is

Windtunnel Review Comments

	considerable scatter among plots in the potential erosion data	
6	It is also not clear how well the selected tunnel test plots might represent the contaminated areas that will be subjected to fires. Additional measurements to characterize the soil and vegetation conditions at the test sites would have been useful for interpreting the wide variability in the test results and estimating applicability of the test site data to comparable contaminated areas.	
7	Unfortunately neither the measurement heights nor the measured values for the wind speed profiles were reported in the data. However the practical result of the scaling problems cited above mean that the aerodynamic roughness and friction velocity values obtained from the wind speed profiles in the tunnel should be regarded only as rough estimates. As a consequence the atmospheric wind speeds at the 10 m height calculated from these values also should be considered only as rough estimates.	
8	To increase accuracy of tunnel estimates it would have been useful to have a cyclone preseparator on the ambient PM 10 filter.	
9	The post fire erosion potential multiplier for the spring fire appears to be a reasonable application of the measured wind tunnel results. This is partly true because precipitation events near the burn event are more frequent than at other seasons.	
10	The post fire erosion potential multiplier for the fall fire is estimated without a clear basis.	
11	The estimated multipliers shows fall fire raises the erosion potential for 24 months. It is not clear that the second 12 months was counted in the frequency distribution matrix Table IV 5 page 45.	
12	While the estimates for annual erosion multipliers appear reasonable for use in RESRAD and RAGS the submitted material is difficult to evaluate because of the absence of information about topography, soil texture, surface roughness, rock cover, etc. High winds have a great capacity to move erodible soil so the state of the surface when high winds occur is the major control factor. To illustrate the effect of high wind speeds after a fire on a sandy soil that is not a limited	

Windtunnel Review Comments

	<p>source see the attached photo taken in southwest Kansas in 1996 If there are contaminated areas that could act as unlimited source areas during high wind speeds the rarity of these events would not greatly impact the annual values of PM 10 used in RESRAD Nevertheless such wind events could act to greatly expand the area of contaminated surfaces at Rocky Flats Hence it would seem important to identify stabilize and restrict activity on those portions of the contaminated areas that might become highly erodible if the vegetation were removed Such measures would help to insure that the assumptions such as limited sources made in developing the RSAL remain valid</p>	
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Windtunnel Review Comments

Review Comments - Wind Tunnel Reviewer #2		Response
<u>General Comments</u>		
1	The appropriateness of this wind tunnel application should be thought of in the proper context The wind tunnel is artificial in many ways It is designed in a way that controls the mean wind speed but cannot reproduce the scale (size) of wind speed variations (turbulence) The ground area exposed to controlled wind erosion is only about one square meter but the variability should be significant between adjacent square meters due to differences in surface condition So testing several one square meter plots becomes essential Using this method the equivalent 10 m wind speeds reported are very extreme Yet the erosion potentials so obtained have use in establishing Radioactive Soil Action Levels providing that we expect that the extreme erosion potentials observed are unlikely to ever exist in nature	
2	It is a matter of controversy that erosion only occurs after a certain wind speed threshold More recent observations show that there is an emission of small particles at speeds below the observed thresholds for saltation, and while this fact amounts to a relatively small emission loss it affects the surface condition	
3	In the protocol each test involves step increases in wind speed and adds accumulated emissions from each step In the wind tunnel saltation, the onset of avalanching may be a product of the peculiar small scale of turbulence and more soil might be available than under natural winds	
<u>Specific Comments</u>		
4	In answer to Focus Group Question 1 regarding equipment suitability for this application This reviewer feels that the equipment is in good standing with the scientific community	
5	In answer to Focus Group Question 1 regarding review quality and thoroughness appropriateness and adequacy This reviewer will make an attempt to show that the observations made by the wind	

Windtunnel Review Comments

	<p>tunnel method provide a set of data that are sufficient to proceed with the determination of Radioactive Soil Action Levels For example I hope to show that particular observations are sufficient to bound the worst case possible inhalation scenario while I acknowledge that normalizing the emission potentials to 95 mph winds are a bit of an extreme In my view there is no need for further study if all we need is to determine Radioactive Soil Action Levels No study may be more definitive in that respect</p>	
6	<p>In answer to Focus Group Question 2 pitot tube adequacy for this application The pitot tube is essential even though various electronic velocity probes would be more elaborate I doubt that we would have any significant change to the results by finer profile measurements</p>	
7	<p>In answer to Focus Group Question 3 regarding working section dimensions for developing desired wind conditions While details [of the wind tunnel design - ed] are not discussed in the reports this is not a new tunnel design, and I believe that the design is adequate The ratio of the test section length to the roughness length is greater than 100 1 which is a good indicator of boundary layer development The main reason for assuring boundary layer development and stability is to characterize and control the shearing stress on the surface The wind tunnel does that adequately</p>	
8	<p>In answer to Focus Group Question 4 regarding small scale effects of surface cover and roughness One limitation of this wind tunnel design is the small working area of the tunnel on exposed soil In order to characterize differences in surface cover and surface roughness the tunnel has to be moved several times and the tests replicated That gives satisfactory statistics between replicate results</p>	
9	<p>Continuing the answer to Question 4 regarding small scale turbulence Turbulent variations on a small scale are abnormal in this wind tunnel however inlet flow conditioning serves to remove the natural large scale turbulence and create small scale turbulence The result is that flow variations are high frequency causing</p>	

Windtunnel Review Comments

	<p>particles on the surface to oscillate something that would not be as important in nature. The concept of soil binding is that the release of any particle does not occur until the aggregate containing the particle is stressed by force imbalance. Oscillations cause different forces than direct shearing stress. An abnormal surface particle behavior may explain why dust concentrations as measured by the tunnel effluent appear to this reviewer to be very large and gives cause for concern that the tunnel method over estimates emission loss and erosion potential. In my opinion the larger values of PM 10 TSP and erosion potential reported may be construed as upper bounds and thus provide a factor of conservatism to protect against unusual inhalation exposure.</p>	
10	<p>In answer to Focus Group Question 5 regarding surface roughness acting to retard release of surface particles. At the high speed in the wind tunnel it is likely that once a particle is in motion it remains in motion until it exits the test section.</p>	
11	<p>In answer to Focus Group Question 6 regarding appropriateness of sampling period. The sampling period is appropriate for this particular protocol. The soil material measured at the tunnel exhaust is the integration of all the observed peaks and the data are summed over all previous wind speed step changes.</p>	
12	<p>In answer to Focus Group Question 7 regarding ability of wind tunnel to reproduce actual meteorological conditions expected during high winds at Rocky Flats and the availability of validation data. The wind tunnel causes resuspension only be increased shearing stress on the surface (measured by friction velocity). Wind records at Rocky Flats show that 95% of the time the winds are less than 18 mph and the friction velocity would be less than 50 cm/s. But the wind tunnel results are expressed for 95 mph winds and friction velocities of about 250 cm/s. So at 95 mph the shearing stress is 25 times the 95th percentile values observed at Rocky Flats. By extrapolation from the frequency distribution of winds observed at Rocky Flats I estimate that the likelihood of sustained 95 mph winds at Rocky Flats</p>	

Windtunnel Review Comments

	is just a few hours each year We have indeed chosen an extreme case	
13	In answer to Focus Group Question 8 regarding wind tunnel's ability to realistically and adequately account for vertical wind velocity The average vertical velocity at the ground surface is zero both in the wind tunnel and outside the tunnel Only the variations (turbulence) in the vertical wind velocity are important, and the 'typical' (root mean square) vertical variations are about the same as the friction velocity it is my opinion that at high speeds the high frequency turbulence would cause abnormal particle behavior on the soil surface in that the oscillations of the particles would cause an over estimation of erosion potential	
14	In answer to Focus Group Question 9 regarding adequacy of wind tunnel to represent the effects of rapid fluctuations in wind speed wind direction and turbulence The rapid fluctuations in wind speed are taken into account through the friction velocity in the wind tunnel The turbulence outside at Rocky Flats may be large but we think of it as gusts that are large in scale (tens of meters) as compared to the wind tunnel where the turbulence is more like 0.01 meter in scale I can accept this turbulence scale difference because I believe that it leads to an over estimate of suspended dust	
15	In answer to Focus Group Question 10 regarding effectiveness of wind tunnel in interacting with differently sized particles The particulates that are resuspended are rarely primary particles That is they are clusters of many kinds and sizes of particles called aggregates The resistance to wind erosion thus depends on the strength of the aggregate bonding The wind tunnel provides sufficient shearing stress at the surface to suspend particle aggregates in the size ranges far greater than the respirable size particles Redeposition [in the tunnel - ed] is negligible	
16	In answer to Focus Group Question 11 regarding the effectiveness of the wind tunnel at reproducing resuspension at different wind speeds	

Windtunnel Review Comments

	for different particle sizes The wind tunnel does control wind speed and can thus be used to estimate erosion potential as a function of wind speed The wind tunnel provides a means of measuring the full range of wind speed effects on erosion potential These results are not subject to any limitation with respect to threshold debates So the data are very useful for determining Radioactive Soil Protection Levels regardless	
17	In answer to Focus Group Question 12 regarding appropriateness of particle sampling protocol There remains one discrepancy that the authors have not satisfactorily explained That is the DustTRACK unit which was calibrated with a standard dust (Arizona road dust) did not agree with the mass sampling train The main function of the DustTRACK was to provide real time particle concentration data and this function was not seriously compromised by the data adjustments	
18	In answer to Focus Group Question 13 regarding the treatment of deposition and resuspension in the wind tunnel It is a safe bet that deposition (or redeposition) is not occurring in the test section fo the wind tunnel for reasons stated previously So particles are entering the sampling train that normally might be redeposited and held at a higher bonding energy This the wind tunnel results would tend to over predict erosion potential	
19	In answer to Focus Group Question 14 regarding methods used to verify sampling efficiency of the wind tunnel One of the best methods of verifying one type of sampling efficiency would be to used the wind tunnel on radioactively labeled soil But of course tha was done here quite independently during the investigations following the wildfire There are other types of verifications that could be done but there is no indication that the tunnel is underestimating suspended mass because of some inefficiency problem In face it is my opinion that the wind tunnel overestimates the erosion potential see question 8	
20	In answer to Focus Group Question 15 regarding activity related	

Windtunnel Review Comments

	intake by humans For all practical purposes the enhancement factor argument can be neglected at Rocky Flats as this data indicates [data are wildfire study data - ed]	
21	In answer to Focus Group Question 16 regarding representativeness of increased air concentration determined by wind tunnel It is the opinion of this reviewer that the results are likely to be an overestimate of suspended dust and erosion potential compared to the worst that would ever be observed in nature Additional analysis of the data may be helpful however	
22	Response to Evaluate if the wind tunnel results are being properly used in developing input values for application in the selected models Because of the extensive data available for screening level purposes the resuspension factor used in risk assessments is recommended (NCRP 129 1999) to decrease as t^{-1} and this is in agreement with the wind tunnel observations at Rocky Flats In the Appendix A of the RSAL Task 3 Report, I saw that the air concentrations as well as the base erosion potential multiplier decrease as $t^{-0.69}$ which is a confirmation that recovery from fire is not unlike the decrease in resuspension factors observed following Chernobyl We should all feel more confident that this is a unifying observation and in line with the NCRP recommendation for screening level risk assessments	
23	I am in complete agreement with the choice taken by the Task 3 Working Group authors to use the observed mass loading distributions for Rocky Flats as the site specific data and preferred over any mass loading data inferred directly from the wind tunnel study The approach is much more realistic than other risk assessment approaches known to this reviewer for the case of fire effects	

Windtunnel Review Comments

General Comments	
No general comments require response	
Specific Comments	
1	Report A [Wildfire Report - ed] uses 38 95% as the ratio of PM10 to total suspended particulate mass but Report B [Controlled Burn Report - ed] uses 50% Since 50% sounds like an approximation and 38 95 sounds like a measurement I would suggest revising Report B with the 38 95%
2	I got confused with the discussion of the mass collected, until I came to the realization that mass collected by the cyclone doesn't have PM10 I think that some rewriting of this section should be done to prevent people like me from getting confused There is no problem with Report B where isokinetic sampling was done
3	Tests were run until the end of soil movement I think it would be informative to compare the times needed for the end of soil movement for the different locations
4	(Trivial) The last line of page D 6 should have 0 0022945 pCi/cubic meter
5	These assumed values may or may not be correct but the curve is dominated by the assumptions not by experimental data The multipliers should be labeled as assumed post fire erosion potential multipliers
6	Addressing FG Q1 The scientists and equipment have a long history of quality work in measuring fluxes of particles emitted by wind erosion.
7	FG Q2 The pitot tube methodology is adequate for characterizing the wind profile since fast response anemometry is not needed
8	FG Q3 One must consider that the results are relative to the length of the wind tunnel and that the work done was self consistent under the conditions that are described in the methodology That is I think that no probable wind tunnel would exactly duplicate all possible

Windtunnel Review Comments

	fetch effects but that some wind tunnel had to be used and that this wind tunnel is probably as good as most would be relative to the fetch effect	
9	FG Q4 This wind tunnel adequately accounts for small scale variations in surface cover and surface roughness It does not account for large scale or middle scale variations however	
10	FG Q5 Roughness can act to dam or retard rather than release particles This happens in nature too Consequently I think that this phenomenon is adequately modeled in a wind tunnel	
11	FG Q6 I assume that the dustTRACK instruments were used to measure when the dust concentration returned to the level from which it started before wind erosion started Therefore I assume that the sampling periods were adequate	
12	FG Q7 The wind tunnel was designed to reproduce conditions near the ground during high winds From tests of the wind tunnel for other locations this tunnel is well suited for this job	
13	FG Q8 Vertical wind variations are modeled well with the wind tunnel See Question 9	
14	FG Q9 In wind tunnels the flux of momentum is carried by smaller scale fluctuation than in outdoor work However one gets the same results by comparing resuspension for the same friction velocity in a wind tunnel or outdoors experimentation That is for the same friction velocity (momentum flux) you get the same resuspension, even though the turbulent spectrum is different for outdoor and wind tunnel winds	
15	FG Q10 See answer 9 above For the resuspension of PM10 the dominant mechanism is the sand blasting of the surface by particles larger than 100 micrometers	
16	FG Q11 Yes wind tunnels and outdoor experimentation give consistent threshold friction velocities for different particle sizes	
17	FG Q12 Non isokinetic flow is corrected for in the report	
18	FG Q13 The wind tunnel results give a net flux for the area sampled by the wind tunnel For the scale involved, however the wind	

Windtunnel Review Comments

	tunnel test is adequate		
19	FG Q14 See answers to above questions		
20	FG Q15 Activity or dust concentration increases with wind speed and this is shown in the data		
21	FG Q16 Yes increases in air concentrations associated with increasing wind speeds are reasonable		

Windtunnel Review Comments

	General Comments	
1	<p>The decision structure and the nature of the information used have not been made sufficiently clear in the presentation Reviewer thinks report needs more discussion of its context</p> <p>How RSALs are used as one of a number of hazard management tools</p> <p>Reviewer thinks the concepts involved in setting an RSAL need to be specifically discussed in the report</p> <p>Reviewer thinks report needs a clearly articulated approach to the treatment of uncertainties</p> <p>Reviewer thinks report needs a clear approach to the treatment of differences between people (variability)</p> <p>Acknowledge historical difficulties such as history of public distrust in the text in an effort to develop a credible basis for planning</p> <p>What is an RSAL?</p> <p>Why does Rocky Flats need them?</p> <p>What were the previous efforts at developing RSALs and why might they change?</p> <p>How will a RSAL be used? (two uses to decide where the surface can be left alone and as one input in deciding the degree of cleanup required)</p> <p>How do RSALs work with other hazard management tools?</p>	

Windtunnel Review Comments

	<p>(Important that everyone understand that RSALs are not the only tool)</p> <p>What are the uses and limits of science in developing an RSAL?</p> <p>What is the risk?</p> <p>What is the dose?</p> <p>What are the circumstances for which risks or doses should be estimated?</p> <p>How are differences between people treated?</p> <ul style="list-style-type: none"> ▪ How are uncertainties accounted for? ▪ What is a reasonably maximum exposed (RME) person? <p>Why do you need scenarios?</p> <p>How do you choose them?</p>	
2	<p>Reviewer wants more transparent explanation of what the science says and doesn't say what is uncertain, what are alternative possibilities and what choices the managers have for dealing with uncertainty</p> <p>Uncertainties important to setting RSALs need to be presented in a clear informative way to both managers and concerned parties</p>	
3	<p>A clearer framework for addressing uncertainties will lead the authors to revisit their discussion of certain key parameters in their model which cause significant uncertainty in the dose and risk levels the most notable of these are</p> <ul style="list-style-type: none"> ▪ mass loading soil ingestion rates the EPA dose and risk estimators <p>These issues should be addressed up front at the beginning</p> <p>A discussion of the strategy and context of the RSALs should be</p>	

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Windtunnel Review Comments

	<p>included up front, right at the beginning This would increase the clarity of the presentation</p> <p>Obligation to acknowledge the uncertainty in a value that is supposed to represent a given percentile of behavior</p> <p>Choice not to include pica child in the child soil ingestion distribution should have more justification</p> <p>Variability in dose and risk factors requires more discussion</p>	
4	<p>Reviewer believes that even in a qualitative uncertainty analysis one would like some sort of statement of confidence about how likely the risk estimate is not likely to be exceeded using that choice of parameter The Reviewer gave an example of categorizing uncertainty into 4 groups a) a best estimate b) an unspecified degree of confidence (some added conservatism) c) high confidence and d) very high confidence that future information will be consistent with the estimate</p>	
5	<p>Reviewer urges agencies to use high confidence values for developing the RSAL rather than the best estimate or conservative estimate of unspecified degree values that largely were used, in order to increase the robustness of the choice</p>	
6	<p>Reviewer thinks it would be useful to include a direct quantitative comparison of the newly selected RSALs with previous values and why there are differences if any Doing this will help understanding and indicate the robustness of the selection</p>	
7	<p>The discussions of various uncertainties need to be synthesized (integrated?) so as to provide a reasonably transparent description of how using any particular calculated value for a RSAL represents taking a position with respect to the underlying uncertainties Key uncertain parameters that would have a substantial impact on the RSALs if changed, should be identified</p>	
8	<p>Reviewer believes uncertainty and variability of ICRP and EPA dose and risk coefficients should be discussed</p>	
9	<p>Reviewer believes uncertainty and variability of ICRP and EPA dose and risk coefficients should be discussed</p>	

Windtunnel Review Comments

10	Reviewer believes the discussion of the sensitivity analysis is not always helpful or balanced. He believes that the sensitivity analysis together with what is known about the uncertainty in various processes should be used to identify the key uncertainties that will impact the selection of a RSAL.	
11	Reviewer believes the discussion of the sensitivity analysis is not always helpful or balanced. He believes that the sensitivity analysis together with what is known about the uncertainty in various processes should be used to identify the key uncertainties that will impact the selection of a RSAL.	

Windtunnel Review Comments

1	<p>Paragraph 2 of Overall Summary</p> <p>Validity of backward calculation method because this method ignores potential correlations between risk or dose and input variables</p>	
2	<p>Paragraph 3 of Overall Summary</p> <p>Inadequate statement of purpose of the probabilistic analysis up front Definition must go beyond a simple determination of a range of outcomes because 'the distributions have to be determined in a consistent manner with the overall purpose</p>	
3	<p>Paragraph 4 of Overall Summary</p> <p>Interjection of bias by the working group by refusing to assign distributions for variables with sparse data, and using instead <u>point estimates</u></p>	
4	<p>Paragraph 5 of Overall Summary</p> <p>Confusing presentation of uncertainty discussion in Section VI</p> <ul style="list-style-type: none"> ▪ Lack of separation between variability and uncertainty ▪ unclear labeling of particular distributions as representing variability or uncertainty (Column 2 in Tables VI 2 to VI 5) 	
5	<p>Paragraph 6 of Overall Summary</p> <p>Applicability of cancer risk factors taken from Federal Guidance 13 which are derived for mixed age group populations to single age groups such as <u>populations that are only adults</u></p>	
6	<p>Paragraph 7 of Overall Summary</p> <p>Quality of presentation</p> <ul style="list-style-type: none"> ▪ Wrong fonts for symbols in equations ▪ References in the text are inconsistent with Table headings ▪ Tables presented in difficult to read format ▪ Failure to present some important parameter values eg the cancer slope factors referred to on p 46 	

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Windtunnel Review Comments

	Reference list has mixture of citation styles	
7	<p>Paragraph 7 of Overall Summary</p> <p>Quality of presentation</p> <ul style="list-style-type: none"> ▪ Wrong fonts for symbols in equations ▪ References in the text are inconsistent with Table headings ▪ Tables presented in difficult to read format ▪ Failure to present some important parameter values eg the cancer slope factors referred to on p 46 ▪ Reference list has mixture of citation styles 	
8	<p>Paragraph 9 of Overall Summary</p> <p>The Working Group should add some expertise to their group and compute new values of the RSALs in a way that is state-of the art and credible to the entire scientific community This work would be rejected for publication</p>	
9	<p>Sensitivity analysis problems</p> <p>Reviewer appears to have understood that the sensitivity analysis for dose and for risk were both performed using Crystal Ball Text needs to be revised to make it clear exactly how RESRAD was used to perform the sensitivity analysis</p>	
10	<p>Text refers to Fig IV-4 (2nd paragraph p 27) but the figure is labeled Fig IV 5 Figure IV-4 is missing</p>	
11	<p>Addition of mass loading for inhalation parameter to the most sensitive list should not have been done because of 'interest in this parameter since the addition of ad hoc parameters is not objective or based on sound scientific principles</p>	
12	<p>Sensitivity analysis problems Impact of using crudely estimated probability distributions on the sensitivity analysis Reviewer questions why final probability distributions were not used in the first place in the sensitivity analysis</p>	
13	<p>Reviewer points out that by choosing a conservative quantile of the output distribution to define a 'reasonably maximally exposed individual the cleanup costs including those to the environment</p>	

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	will be greater	
14	Bias is interjected when point estimates are used instead of all probability distributions. Reviewer thought the open space and office worker scenarios should have been done probabilistically too and that a more complete explanation should have been given as to why this was not done.	
15	Little or no attention was given to whether the contamination in soil is uniform enough (on a micro scale) to be adequately described by a single concentration value. Reviewer supplied a graphic to support his point. Reviewer believes any impacts of non uniform contamination in soil on sampling on ingestion and on long term risk calculations need to be addressed.	
16	Confusing presentation of uncertainty discussion in Section VI. Expand uncertainty discussion of proper absorption category (M or S) for dose conversion factors to show that the different agencies held different beliefs.	
17	Wrong number of significant digits expressed in the americium plutonium activity ratio.	
18	Decision to use 0.4 instead of 0.8 as a building shielding factor was a good one.	
19	Decision that erosion potential quickly decreases after a fire is reasonable. The decision that drought could occur 20% of the time also is realistic.	
20	Discussion regarding the soil ingestion rate was too long given the weaknesses in the data.	
21	NCRP Report 129, 1999 was not referenced.	
22	Central tendency values for children were reasonable. However the reviewer was skeptical of how long the maximum consumption value (1000 mg/d) might actually be sustained by a child.	
23	The soil ingestion rate for an adult does not seem reasonable.	
24	Figure A.7 is off the page and useless and the text on page 32 is continued to some unknown location.	
25	Reviewer would like a specific comparison with the screening	

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	methodology reported in NCRP Report No 129	
26	The recovery curves following a fire made sense to the reviewer	
27	The discussion of the RESRAD Inhalation area factor was not clear to the reviewer	
28	In general, the reviewer thought that the values recommended in the child soil ingestion rate distribution are consistent with other analyses he has seen, and that 'the ingestion rates have been adequately quantified for the intended purposes The reviewer expressed some doubts as to whether 1000 mg/d could really be sustained by a child for any length of time	
29	Confusing presentation of uncertainty discussion in Section VI Reviewer was unclear as to why draft Task 3 identified possible sources of uncertainty if it wasn't going to be quantified The reviewer indicates that a 2 dimensional analysis must be conducted whereby separation (between variability and uncertainty) is maintained	
30	The reviewer thinks that combining data from different studies which are weighted appropriately according to whether they used mass balance or not would likely not result in a different distribution than that from the Anaconda study Since this distribution is not inconsistent with that from the independent NCRP Report 129 1999 the reviewer thought the analysis done in draft Task 3 was appropriate	
31	Page 6 Reviewer has never heard of the concept of pathways being considered complete	
32	Page 9 Reviewer has problem with the use of the term conduct to describe a pathway He recommends using conventional jargon, not to change terms or invent new definitions	
33	Page 9 Reviewer has never heard of the term active pathways All pathways should be realistic Use conventional radioecological definitions	
34	Page 9 Reviewer does not believe that the assumption that the	

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Windtunnel Review Comments

	surrounding areas of the residential site are uniformly contaminated is realistic and cites several articles that indicate that Rocky Flats is not uniformly contaminated. Reviewer believes that overly conservative bias is interjected into the analysis by oversimplifying the model in order to make calculations easier.	
35	Page 18 As part of the water discussion, the Reviewer would like a discussion of how activity of particles can change with size.	
36	Page 19 The equation for the RSAL based on risk provides no units for the parameters. The multiplication signs in the risk equation show in the document as left printing arrows. The paragraph above the risk equation uses the wrong terminology. First, there is no dose equation. Second, the Reviewer believes the word activity should have been used instead of exposure. Similarly, the word exposure was used instead of intake on p 46 2 nd paragraph last sentence.	
37	Page 20 The uncertainty around EPA cancer slope factors and dose conversion factors should be quantified since these factors are the most uncertain parameters. The reviewer believes that using point estimates for these parameters falsely expresses a belief in the values used as extremely high and that alternative values are unlikely.	
38	Page 29 The reviewer did not understand the material presented in Section IV 3. Specifically, the reviewer did not understand what was meant by a saturated pathway.	
39	Page 31 Reviewer wants qualification of the statement that inhalation rate is linearly related to dose and risk only when the particle size remains constant.	
40	Page 34 Interjection of bias by the working group by refusing to assign distributions for variables with sparse data, and using, instead, point estimates. Reviewer believes uncertainty should always be	

Windtunnel Review Comments

	quantified	
41	<p>Page 36 to 41</p> <p>Quality of presentation</p> <p>Tables IV 3 and IV 4 are needlessly confusing and sloppy</p> <p>Pages that are continued do not have column headings</p> <p>Way these tables are presented in the document is so that one has to read right to left</p> <p>The parameters of each distribution are shown but the definitions for them i e min, max etc are not</p>	
42	<p>Inadequate statement of purpose of the probabilistic analysis up front</p> <p>Reviewer wants a quantitative uncertainty analysis</p> <p>Confusing presentation of uncertainty discussion in Section VI</p>	
43	<p>Page 53 first paragraph, last sentence Interjection of bias by Working Group s refusal to assign distributions for variables with sparse data, and using point estimates instead</p>	
44	<p>Page 55 and 56</p> <p>Confusing presentation of uncertainty discussion in Section VI</p> <p>Reviewer wants a quantitative uncertainty analysis</p> <p>Quality of presentation Tables VI 1 to VI 5 read from right to left with successive pages located to the right</p>	

Windtunnel Review Comments

1	<p>Page 8</p> <p>It seems confusing to me to put volatilization from the soil in the Site Conceptual Model and then in a subsequent paragraph state that volatilization is not considered in this report because that is only an issue with uranium and not plutonium or americium. Will that be addressed differently when uranium is added to the report? This issue arises with all of the Site Conceptual Models</p>	
2	<p>Page 18 III 3 1st paragraph</p> <p>The AME group now believes that americium in the environment at RFETS is due to its being released with plutonium and not due to in growth. Does this new information have any effect on the results?</p>	
3	<p>Page 18 III 3 3rd paragraph</p> <p>Just a comment that, as per Chris Dayton, the aseptic groundwater wells showed Pu contamination (albeit very low level) and so the search continues for the source of contamination</p>	
4	<p>Page 19</p> <p>What are the units on the RAGS equation parameters?</p>	
5	<p>Page 23 Table IV 2</p> <p>The value used for the Area of Contamination Zone is outside of the range of sensitivities tested. While the model is not very sensitive to this parameter, is it anticipated that the effect of this parameter on the final number will not differ at higher values from the effect at lower values?</p>	
6	<p>Table IV 2</p> <p>Were parameter values labeled as distributions in the 'Value Used' column within the sensitivity ranges tested? If not, I ask the same question I asked in 5</p>	
7	<p>Table IV 2</p> <p>The value used for the external gamma shielding factor was outside of the range of sensitivities tested. The model is moderately sensitive to this parameter. I ask the same question asked in 5</p>	

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8	<p>Page 45 How and why was the 96th percentile mass loading value used for calculations? Does this percentile take the fall fires into account since they are above the 96th percentile?</p>	
9	<p>Page 49 Another suggestion Make it clearer within the text and title for the SOR table that the SOR table shows only an example of RSALs based on a given location and that if the Pu Am ratio changes the RSALs will also change</p>	
10	<p>Page 50 V 2 What is the time frame for RSAL exposures? Are they to be protective over a 25 yr average or for an annual average for 25 years?</p>	
11	<p>Page 51 last paragraph Because RSAL calculations for the most part are the inverse of risk calculations the reasonable maximum exposed range for RSALs corresponds to the 1st through 10th percentiles with the 5th percentile as the recommended starting point Are RSAL calculations are the inverse of risk calculations? Is the intention to say that the 99th % RME risk corresponds to the 1st % RSAL?</p>	
12	<p>12) Appendix B page 4 What is the Area Correction Factor used in the RAGS equations for External Exposure? Is this the same parameter used in RESRAD? If so I thought the RAGS equations didn't use that dilution factor</p>	

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1	Overall the spreadsheet is crafted nicely and easy to follow. There are a few issues of style that I will discuss later.
2	The single largest concern that of security. None of the cells in the spreadsheet are locked. It is very easy to modify cells unintentionally.
3	<p>In my examination of the four spreadsheets I uncovered only one spreadsheet whose equations were not consistent with Appendix B. The risk equation for inhalation for an Open Space User read in Appendix B as</p> $Risk_{inhalation} = PRG * IR_{a_age} * ED * EF * ET * ML * CF_I * SF_{inh}$ <p>where * indicates multiplication. In the actual spreadsheet this computation is given as</p> $Risk_{inhalation} = PRG * IR_{a_age} * ED * EF * ET * ML * CF_I * [ET_0 + ET_i * DF_i] * SF_{inh}$ <p>Where</p> <p>ET₀ = Exposure time fraction, outdoors ET_i = Exposure time fraction, indoors and DF_i = Dilution factor indoor inhalation</p> <p>This latter formula is analogous to the one used for the residential scenario.</p>
4	There is also an error in labeling. The acronyms for 'Inhalation rate child' and 'Inhalation rate adult' in cells C14 and C15 are reversed. Both Am 241 and Pu 239 have their inhalation risk computed using this latter formula.

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5	One further comment is on style. It would be preferable to have the adult data consistently placed before the child data in this spreadsheet. In light of this remark, interchanging rows 21 and 22 would be helpful. However, all of the formulas are correct and consistent with the current arrangement.	
6	In the process of examining the Open Space scenario, there appears to be a mistake in the variable definitions as follows: $IR_{child} = \text{inhalation rate for children}$ $IR_{adult} = \text{inhalation rate for adults}$ <p>should be ingestion rates. If not, there is a further error in the spreadsheets regarding these variables.</p>	
7	All of the slope factors for toxicity levels are new and old inputs. The spreadsheets consistently reference only the new data. It is not clear to me why the other old data is entered at all but the references are consistent throughout all of the spreadsheets.	
8	The residential scenario spreadsheet <ul style="list-style-type: none"> Is ED the same as ED_{ge} in cell C24? It appears that it is. Why is cell E16 rounded from 8.71 to 8.7? Why is 210/1445 in cell E20 rounded to 15? Why is 1235/1445 in cell E21 rounded to 85? <p>The equation for food risk in cells E60, E61, E69, and E70 are cumbersome and not implemented. However, they are correct.</p>	
9	The wildlife refuge scenario spreadsheet <p>The origin of the computation $(\\$J\\$14 + (\\$K\\$14 - \\$J\\$14) * \\$F\\$14)$ for the probabilistic risk in cells C41 and C42 are unclear. It appears as though the inhalation rate is computed using this formula.</p>	
10	The office worker scenario spreadsheet	

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	<p>The point estimate and probabilistic data are identical Why have the two separate schemes if only one is going to be used In cells C6 through F6 and C7 through F7 the values are toggled between point estimates probabilistic using a value input in cell B52 If B52 = 1 the values recorded in these cells will be based on point estimates Otherwise they will be based on probabilistic estimates In this spreadsheet there are no probabilistic estimates being used However the value in B52 is set to 2 indicating that probabilistic estimates are requested All in all this approach seems to be unnecessary</p>	
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	Review Comments	Response
1	Overall the report is well organized surprisingly readable given the number of contributors to it and contains key information necessary to understand the science supporting the risk assessment	
2	While not necessary for communication between professionals page numbers within specific citations would help the layperson find information contained in some of the bigger documents I had trouble for instance finding a statistic of interest in the Exposure Factors Handbook As this reference is really a compendium of studies it would be helpful to know exactly which study the statistic came from and on what page number it could be found	
3	Inconsistencies between the scenario description and the scenario parameters chosen can be extremely misleading For instance the refugee worker is not someone assumed to work eight hours per day for five days per week and for 50 weeks per year (p 7)	
4	Tables VI 1 2 3 4 should clearly distinguish between those areas where the Working Group has followed standard methods used by risk assessors to account for uncertainty (e g placement of the receptor on the contaminated area is a standard assumption in risk assessment) and where they have added an extra measure of conservatism (e g setting depth of contamination equal to depth of roots) This would better enable to risk managers to assess whether the risk estimates strike an appropriate balance between realism and conservatism	
5	Although the conclusion of Section VI makes a weak attempt to show that the risk assessment strikes a reasonable balance [This conservatism is balanced <i>somewhat</i> by use of average ingestion rates By doing this it was <i>hoped</i> that a balance could be struck (p 84 emphases mine)] the tables themselves (Tables VI 1 2 3 4) do not seem balanced, and run the hazard of giving the risk managers and DOE headquarters the impression that the risk assessment is unrealistically conservative An example of this I	

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	believe is the exposure frequency for the rural resident (p 70) The distribution is based on data from the Exposure Factors handbook that show the average person spends 64% of their time at home This choice which the report calls relatively conservative is arguably quite realistic	
6	As stated in the report risk assessment guidance supports giving point estimates along with the probabilistic results This could easily have been done and perhaps should have been done for the benefit of the risk managers who need to know if the probabilistic calculations differ significantly from the point estimate approach and if so why	
7	I believe the report should also do a better job of explaining the strengths and weaknesses of the risk assessment process used in the Task 3 Report For instance the risk managers should be aware that while EPA guidance does not recommend modeling cancer slope factors as probability distributions the point estimates used are central tendency estimates The study Assessing the Risks of Exposure to Plutonium from Inhalation and Ingestion (Grogan, et al) speaks to the possibility that the cancer risk of exposures to plutonium may vary by orders of magnitude Consequently had this variability been reflected in the inputs for the cancer slope factors there might have been a substantial effect on the RSAL	
8	P 7 para 3 Refuge worker scenario description is misleading Refuge worker is assumed to spend 8 hr/day 5 days/week 50 weeks/year on site This implies use of a point estimate when in fact the exposure frequency parameter is being treated probabilistically with an average of 225 days per year and a range of 200 to 250 days per year	
9	P 9 para 4 Rural resident scenario description is technically correct when it says resident spends up to 350 days per year on site More informative however would be to give the range (175 - 350) and the average value of 234 days per year	
10	P 43 last para. Change the word RESRAD to RSAL	

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11	P 53 1 st para Report speaks to importance of assessing the strengths and weaknesses of information used in the modeling (e.g. parameter inputs) then says These strengths and weaknesses should be communicated to the risk decision makers for them to make health protective remedial decisions Now that the Working Group is no longer in a rush to finish the report, they should go through the report methodically to make sure they have achieved this goal in a balanced accurate fashion	
12	P 55 para 5 Report states no attempt was made in this assessment to quantify uncertainty Is this really true? Probability distributions were chosen for some scenario parameters such as exposure frequency and duration Page 56 states There is scenario uncertainty intrinsic in all of these choices	
13	P 57 para 1 In other cases such as exposure duration for the rural resident quite a lot of confidence can be placed in the distribution chosen This distribution came from a recommendation made by EPA in the 1997 Exposure Factors Handbook EPA assigned a confidence rating of high, medium or low to the various parameters recommended Exposure duration received a medium confidence rating	
14	Sect. VI p57 83 A potentially important piece of information that appears to be missing from this section is whether the modeling choices made by the Working Group adhere to standard practice in risk assessment This would enable the RFCA principals to ascertain where in the risk assessment the WG has added an extra measure of conservatism, and where they have simply followed accepted methods	
15	P 58 59 Report fails to point out large uncertainties inherent in cancer slope factors Slope factors themselves are central tendency estimates that may either over or under estimate risks	
16	P 59 last entry Report fails to point out that for inhalation pathway RESRAD also assumes dilution of contaminated dust from upwind fetch. The model assumption of wind constantly blowing means	

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	model is taking credit for constant dilution as well Wind tunnel studies suggest that while this assumption may be appropriate for point source emissions it is an oversimplification in the case of fugitive dust emissions such as occur with dispersed surface soil contamination	
17	P 60 4 th entry INCORRECT Fire is <u>NOT</u> assumed to occur every year on contaminated area, but only 10% of the time Also statement on burn frequency is confusing Burn frequency of once every 10 years or 10% is assumed While this may be a conservative assumption, the probability of a wildfire on contaminated grassland at some point in the future is 100% Conceiving fire as a prescribed burning regimen was done mainly for ease of computation, and the difficulty of estimating a burn frequency due to wildfire not simply to add a margin of conservatism	
18	P 60 last entry Not necessarily I know a doctoral candidate at Colorado State University whose research has focused on Rocky Flats and who asserts that the maximum Am dose occurs at Year 2038	
19	P 62 1 st entry For the rural resident whose 5 acre ranchette is much smaller than the contaminated area, the assumption that he/she spends the entire time on the contaminated area is realistic not very conservative as characterized by the Working Group The same assumption for the refuge worker whose geographic range would likely extend over the entire 6500 acres is very conservative	
20	P 62 3 rd entry For the adult soil ingestion parameter on which almost no data exists it is speculative to say the 100 mg/day point estimate is 'relatively conservative Better to call it a highly uncertain parameter	
21	P 70 2 nd entry When exposure time is viewed in conjunction with exposure frequency and outdoor time fraction, it is clear that the receptor being modeled is not homebound or an invalid On days when the resident is home he/she is indeed home 24 hours However since the distribution being used for exposure frequency	

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	has a mean of 234 days per year the average receptor actually spends a great deal of time (a third of the year) away from home	
22	P 70 The 75 th percentile values used for indoor/outdoor time fraction seem are neither average values nor upper end values but something in between Is this what is meant by the term relatively conservative?	
23	P 70 last entry The exposure frequency distribution is based on one statistic the percentage of time the average American spends at home (64%) Multiplying by 365 days per year gives 234 days per year which becomes the mean of the triangular distribution developed by the working group The upper and lower truncation limits were chosen on the basis of professional judgment with 350 days considered to be the maximum and the minimum arbitrarily chosen as half that Use of a triangular distribution implies the parameter is poorly characterized Is this the case for exposure frequency or is better data available from which to develop a more accurate distribution? If there is better data, why didn't the working group use it?	
24	P 72 1 st entry Choice based on standard practice in risk assessment not the possibility that contamination will be forgotten While it does likely result in over estimate of risk, report should emphasize that to do otherwise the working group would have been deviating from the professional norm	
25	P 73 1 st entry Report should emphasize that the point estimate of 100 mg/day is for agricultural workers not just an average sedentary adult	
26	Appendix A P 31 bottom For this analysis the ultimate goal is to use quantitative information on variability and uncertainty in exposure to help inform the risk management decision at Rocky Flats Contradicts page 55 paragraph 5	
27	Appendix A P 47 last para Replace 'simplify' with 'simplify'	

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28	<p>Appendix A P 54 3rd para The following probability distribution is recommended for use in risk equations that are based on EPA RAGS guidance Misleading The guidance recommends the equations not the distribution The working group chose the distribution based on information from a survey at Rocky Mountain Arsenal</p>	
29	<p>Appendix A P 56 2nd entry This receptor s residency period on site is divided between childhood and adulthood hence the exposure duration parameter involves an additional layer of complexity that is not transparent in the report If the exposure duration were a point value of 30 years the parameter would be partitioned as 6 years of childhood followed by 24 years of adulthood However since this parameter is modeled as a distribution, it is not clear from the report alone how the breakdown between child and adult exposures is being handled (Examination of the risk spreadsheet reveals that for each monte carlo realization, the first six years of exposure is attributed to the child – which the working group claims is standard practice in risk assessment.)</p>	
30	<p>Appendix A P 61 2nd para Once again, report implies this exposure frequency distribution for the rural resident is recommended by guidance when in fact the working group chose it based on data published in the EPA Exposure Factors Handbook</p>	

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1	Professional judgment is used as justification for many of the parameter choices in the report. However the phrase professional judgment by itself is not particularly informative. To the degree possible the working group should fully explain the rationale used to arrive at parameter selection.	
2	Incomplete citations make it difficult to independently verify some of the conclusions reached by the working group.	
3	The report doesn't do justice to the rigorous scientific debates that took place within the working group. In some cases the rationale given in the report does not fully reflect the logical argument behind the parameter selection. A prime example of this is the indoor dust filtration factor where the report fails to explain why a value at odds with EPA guidance was used.	
4	The report should explain parameter selection criteria and the process of how parameters were chosen.	
5	Highly technical language in some sections of the report creates a barrier to understanding for members of the general public who may not have a scientific background.	
6	The report should make better use of diagramming and tables. Charts and tables should stand alone and make the point so that key information could be gleaned even without reading the entire text of the document.	
7	Tables VI 1 VI 2 VI 3 and VI 4 the main part of the section on uncertainty could be improved through reorganization. A grouping according to source uncertainty would be helpful.	
8	At the RFCAB modeling workshop one of the presenters referred to a soil ingestion study just completed in the state of Washington by a researcher named Davis. Did the working group follow up to see whether any data from that study might be useful to the RSAL calculation in estimating this important parameter?	
9	The RSAL calculations for the rural resident and open space user.	

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	scenarios do not take into account extreme soil ingestion behavior that has been observed in a small (but not negligible) percentage of children If the goal of risk assessment is a realistic estimate of exposure is it permissible to ignore this real phenomenon?	
10	The risk equations assume the office worker and open space user both ingest the majority of their daily soil intake while onsite Is this assumption scientifically defensible?	
11	Is it appropriate to use soil screening equations which are simplistic and overly conservative and don't take into account ingrowth and decay of radionuclides to derive an RSAL?	
12	The exposure frequency distribution (number of days per year spent on site) for the rural resident is a triangular distribution based mainly on professional judgment It has been said within the working group and elsewhere that use of a triangular distribution implies the parameter is not well characterized Indeed the only actual data point in the distribution developed by the working group is 234 days per year taken from a survey of the amount of time the average American spends at home each year Is more information available on this parameter? If so how does the 95 th percentile of the working group's distribution (318 days per year) correspond with actual survey data?	

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Review Comments	Response
1	<p>In general this is a good report, clearly written with a thorough and thoughtful process. The authors have done a very good job. This analysis is one of the most comprehensive and complete ever sent to headquarters.</p>
2	<p>There is much discussion throughout the document about the CERCLA risk range specifically how the risk range goes from 10^{-4} to 10^{-6}. However EPA officials have repeatedly stated that the risk range extends to 3×10^{-4}. In addition, OSWER No 9200 4 18 states Guidance that provides for cleanups outside the risk range (in general cleanup levels exceeding 15 millirem per year which equates to approximately 3×10^{-4} increased lifetime risk) is similarly not protective under CERCLA and generally should not be used to establish cleanup levels. Consequently for this set of risk calculations it appears that the upper value for the risk range should be 3×10^{-4} rather than 1×10^{-4}. The calculations in this report as summarized in the table in the Executive Summary on page 1 clearly demonstrate that an annual 25 millirem cleanup level can be within the CERCLA risk range when the risk range is extended (per EPA policy) to 3×10^{-4}. The risk range can be extended to 3×10^{-4} by multiplying the entries at the risk level of 10^{-4} by 3 and comparing the product to the 25 mrem annual dose column. For the cases in which there were probabilistic calculations the 25 millirem per year entry is within the CERCLA risk range. For the deterministic calculations the 25 millirem is not within the CERCLA risk range however the 25 millirem limit is subject to ALARA. There are two points to this comment. First, if the goal of the analysis is to show the range of cleanup alternatives that can be considered the risk range calculations should be extended to 3×10^{-4}. This will provide a more comprehensive range under which CERCLA modifying factors can be considered or in the cases of AEA based standards define the limit for the ALARA process to consider. Second the document</p>

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	will better show that the CERCLA process using its risk range constraints and modifying factors results in cleanup options essentially equivalent to the AEA based 25 mrem/year plus ALARA process (i.e. the process being implemented at Rocky Flats will satisfy all applicable or relevant requirements) The document clearly shows to the perceptive reader that the two processes are very compatible and it would be valuable to make that clearer for those that might not notice	
3	The wildlife worker scenario is overly conservative Only 300-400 acres of Rocky Flats has significant levels of residual radioactivity Given the site area of thousands of acres it is incorrect to assume that a wildlife refuge worker was employed full time on a small portion of a much larger parcel It is recommended that a more realistic assessment of outdoor occupancy be provided Clearly given the ratio of lands that contain residual radioactivity to those that do not it is very conservative to assume all of the workers outdoor time is spent in the areas containing residual radioactivity If it is not possible to get a better estimate of remote to office based activities for the workers the conservative assumption should be clearly stated in the Wildlife Refuge Worker section (III 1)a	
4	It would also be useful for clarity in the first paragraph of this section, last sentence to insert after scenario represents something that says this worker is the critical group or maximumly exposed individual under this use (e.g. scenario represents the maximumly exposed individual under the most likely future use of Rocky Flats) The reason is many will note that there are likely to be others on the site (even though the most effected of those others are the campers and hikers who are addressed in a separate analysis) and this statement clarifies that the worker has the highest risk or dose	
5	The other scenarios discussed lifetime exposure assumptions (up to 40 y for rural resident and 25 y for office worker) but for some reason this section does not specifically state a time period This is	

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	not critical as later in the table on page 16 it is listed	
6	There is an assumption that the fires burn off vegetation which in turn leads to higher airborne particulates and a higher radiation dose. Fires of a sufficient severity to denude the site of vegetation would likely damage or destroy structures. How is it that the assumed fires do not burn houses or crops? This consideration should be acknowledged in the report.	
7	The relatively high level of irrigation (assumed to be 1 meter per year) is necessary to grow the hypothetical plant foods. But fire severity and frequency would likely be much lower in cultivated irrigated land than in open prairie. This circumstance should be discussed. In addition, the high assumed rate of irrigation would greatly increase plant recovery after a fire. The report should acknowledge this consideration.	
8	The assumptions involving hypothetical fires are contradictory since it is assumed that the fires consume vegetation, yet plant foods grown on site are eaten as food. Consequently it is recommended that the prairie fire scenario for the rural resident be revised by comparing the radiation doses from the plant food ingestion pathway and the inhalation pathway. If the dose from the inhalation pathway is larger under assumed fire conditions then the plant food pathway should be ignored. Alternatively if the plant food pathway is larger under assumed fire conditions then the incremental inhalation exposure from the hypothetical fire should be ignored. However it is a gross overestimate to assume both the consumption of all vegetation by a fire and consumption of plant foods grown on site.	
9	The 'rural resident' land use has some other assumption that overestimates dose and risk. The very act of building a home and garden tends to dilute and disperse radioactivity through land use activities such as excavation, construction of foundations, installation of water sewer and septic systems, plowing, clearing of land, establishment of roads and the like. Most of the residual plutonium is in the top 2-3 inches of soil and these activities would	

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	tend to mix the soil in a more homogenous manner The assumed mixing zone thickness (1.5 meters) of soil for inhalation and soil ingestion purposes is appropriate for some of these activities but not for all In short the very act of constructing a house and garden would lead to a further reduction of the concentration of any residual radioactivity and thereby reduce dose This consideration should be discussed in the report	
10	The installation of roads would decrease airborne radioactivity and also decrease the effects of a fire The decreased effects from a fire would come from the road being a firebreak from the pavement preventing radioactivity from becoming airborne before or after a fire and from the road facilitating fire fighting efforts	
11	The assumption that residents could remain on site for as much as 24 hours a day for 350 days a year for 40 years is a clear overestimate It is much more likely that adult residents would have some form of outside employment, and this employment would lead to residents being off site perhaps 45 hours per week The income from outside employment would be needed to pay for utilities (irrigation, water sewer telephone power gas etc) property taxes off site foodstuffs (meat milk, grains etc) and other cash expenses It is also likely that children would attend school in keeping with public policy The notion that site residents would remain on site for 40 years without leaving is not plausible While site occupancy was handled as a probabilistic variable even the possibility of near full time occupancy is very dubious	
12	In short, the rural resident land use has a series of unlikely assumptions <ul style="list-style-type: none"> ● All land use controls are lost ● The Federal State and municipal governments do not intervene ● Farms are constructed with a size of 5 acres ● Construction for homes and roads do not affect the residual radioactivity despite the excavation and grading for roads 	

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	<ul style="list-style-type: none"> utility pipes and buildings These farms produce sufficient income to pay taxes and utility costs The farm residents do not necessarily have outside employment Children spend most of their time on site and may not attend school off site Irrigation is adequate for growing vegetables which are part of the resident's diet Fires occasionally affect the farm notwithstanding the irrigation levels The municipal fire departments do not exist or (alternatively) are unable to fight the fire Farm roads and streets do not act as firebreaks or otherwise facilitate firefighting After a fire airborne dust is elevated Irrigation does not affect the regrowth of vegetation and Despite the fires consuming vegetation structures and homes are not affected 	
13	<p>Taken as a whole these assumptions are quite unlikely</p> <p>The office worker scenario assumes that a fire would burn all vegetation but not damage or destroy the building While reasonable land management would be expected around an office building and this management would likely control an area a few acres around the buildings to landscape the building construct parking lots minimize fire hazards and ameliorate post fire impacts But these same land management steps would reduce airborne radioactivity from non fire situations In short, the assumption that a fire would burn the vegetation without destroying buildings is a dubious assumption But the assumption that buildings are protected without a reduction in airborne dust from the office land use is equally dubious</p>	
14	<p>The office worker scenario does not examine consider the</p>	

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	<p>maintenance or landscaping of the office building. However, the scope and duties for a building maintenance job are similar to those of a wildlife worker. Consequently, the likely impacts to an office maintenance employee have already been considered, albeit under a different scenario. This section should discuss those employees (under this scenario) that may spend time out of doors and specifically state they are considered under the other scenario or quantitatively or at least qualitatively discuss the difference from the office worker.</p>	
15	<p>It might be argued that a wildlife worker worked all over the site while an office maintenance worker worked only in close proximity to the buildings for which he or she is responsible. However, the amount of excavation required to build an office building and parking lot would significantly reduce the soil concentration of any residual radioactivity through soil mixing. Thus, construction activity would tend to offset the possibility that an office building was located in an area with elevated plutonium concentrations.</p>	
16	<p>Comparability to Other Cleanups: These RSAL calculations show cleanup criteria with dose and risk that are much lower than the dose and risk from cleanups of sites involving radium. At these sites, a cleanup criterion of 5 pCi/g is typically used, the sites at which this criterion have been used include Montclair (NJ), Landsdowne (PA), Radium Chemical (NY), Denver Radium (CO), and numerous uranium mill tailings sites. Consequently, why should the dose and risk after cleanup at Rocky Flats be lower for any particular scenario than at sites that are planned for free release? After all, at Rocky Flats the most likely future land use is a wildlife refuge and residential use is likely at many of these other sites. It is recommended that this comment be addressed by inserting 5 pCi/g of radium 226 into the parameter sets for the computer codes and examining the dose or risk of the output.</p>	
17	<p>Authors On the cover sheet, the names of the authors and their affiliations</p>	

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	should be shown. Similarly the names of reviewers (both technical reviewers and reviewers within the management of the various organizations) should be listed separately perhaps in an acknowledgment section	
18	<p>RESRAD Version</p> <p>On page 1 mention is made that RESRAD version 6 0 was used for calculations Was this version used by mutual agreement of the different organizations? The current version of RESRAD available from Argonne National Laboratory is Version 6 1 It may be that an agreement was reached to freeze the RESRAD version because of the length of time required for the calculations and to avoid rework simply because a new RESRAD version became available If there was such a freeze agreement, it should be mentioned</p>	
19	<p>Dose Factors</p> <p>Dose conversion factors are discussed frequently within the document This document uses 'updated dose conversion factors from ICRP report 60 and later dosimetry The problem with this usage is that DOE NRC EPA and the State of Colorado all <u>officially</u> use EPA Federal Guidance Reports 11 and 12 for dosimetry and these documents are based on ICRP reports 26 and 30 For example the NRC Decommissioning Rule specifies an annual dose limit of 25 millirem effective dose equivalent the term effective dose equivalent is a term defined in ICRP 26 and 30 but not in ICRP 60 and later reports Dosimetry from ICRP 26 and 30 are heavily incorporated into a host of EPA, NRC and DOE requirements including (but not limited to) 40 CFR 191 40 CFR 192 40 CFR 61 10 CFR 20 10 CFR 835 and DOE 5400 5 All of these regulations specify or imply the use of organ weighting factors and other details which are exclusively used in ICRP 26 and 30 dosimetry The usage of dose factors other than those specified in these regulations raised a host of issues as to whether the requirements are in fact, being complied with Further the 'updated</p>	

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	dose conversion factors have not been officially approved by EPA since EPA has not withdrawn Federal Guidance Reports 11 and 12. Consequently the use of ICRP 60+ dosimetry without clear cut official approval is problematical and there is a serious policy question about the development and use of dose factors at individual sites (DOE NRC EPA) in an <i>ad hoc</i> manner	
20	<p>Presentation of Results</p> <p>The authors do an excellent job of factually presenting rationale assumptions parameters calculations and sensitivity analyses in a scientific manner. In doing so they have developed a very credible report. However they should also take as much care in presenting the results. Clearly these analyses and the results are probably only good to one significant digit at best. The results provide for example in Tables VI 1 V 2 V 3 V 4 and V 7 as well as in the Executive Summary should have only one but certainly no more than 2 significant digits. More than 2 significant digits portrays a precision that greatly exceeds the knowledge base. If for some reason, it is felt necessary to maintain the digits for calculation accuracy at least place a footnote on each table indicating that the analyses only justify one significant digit but are presented as calculated because This should also be discussed in Section VI</p>	
21	<p>Sensitivity Analysis</p> <p>In Section IV it is surprising that the sensitivity analysis feature of RESRAD was not used for this work</p>	
22	<p>Page 3 third bullet the EPA rule was never formally proposed or promulgated. In fact, EPA withdrew the draft rule from review at the Office of Management and Budget prior to its publication as a proposed rule in the <u>Federal Register</u>.</p>	
23	<p>Page 3 last complete sentence at the bottom of the page This sentence should be reworded to read as follows 'Earlier versions of RESRAD were used by the agencies in 1996 later the Risk Assessment Corporation modified RESRAD for its own use</p>	
24	<p>Page 4 Second bullet In the last sentence of the bullet, there is a</p>	

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	discussion that EPA guidance requires consideration of the maximally exposed individual Both NRC and DOE also require this consideration within their respective regulatory frameworks	
25	Page 7 last sentence in the first paragraph change the last part of the sentence to read 'the wildlife refuge worker scenario represents the maximally exposed individual from the most likely future use of Rocky Flats	
26	Page 7 second paragraph The assumption that residual radioactivity is present at the entire site at the RSAL level badly overestimates the radiation exposure of workers since most of the site has little or no plutonium	
27	Page 7 second and third paragraphs It is likely that the number of wildlife workers at Rocky Flats would be small and the small number of workers would prohibit an on site childcare facility because of economic considerations Specifically there would not be enough workers to make a childcare facility economically viable	
28	Page 9 first paragraph in section b There is a discussion of periodic wildfires which would burn off accumulated vegetation How do the fires burn off the vegetation without burning off the homes and crops?	
29	Page 11 second paragraph for the Open Space User Scenario There is a brief discussion of increases in airborne particulates following fires It should be noted that, after a fire visits might increase from curiosity seekers but decrease over the longer term because of the adverse smell	
30	Page 17 In the second to last sentence in the Direct Dermal Absorption Contact Pathway mention should be made of the current usage of municipal water systems in the area. A similar comment should be inserted in the last sentence of the second paragraph in the section entitled, Ingestion of Surface Water Ground Water and Food	
31	Page 18 In the first paragraph of the section entitled Solubility of Plutonium and Americium the discussion of RESRAD in the fourth	

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	<p>sentence is in error This sentence states The RESRAD groundwater transport calculations treat plutonium and americium separately and do not adequately represent the behavior of weapons grade material containing both RESRAD uses distribution coefficients (Kd) to describe the partitioning of radionuclides in solution The user specifies the distribution coefficients by inputting them or using default values Alternatively the user can specify solubility limits to describe the behavior of aqueous radionuclides and RESRAD will calculate a Kd using the specified solubility limit The problem mentioned here arises when the wrong Kd is input by a user If the dissolution of Americium is similar to that of plutonium they would have the same Kd This paragraph needs to be rewritten to indicate that the behavior of americium is atypical because of its association with plutonium in many on site areas However there were separations of americium from plutonium at Rocky Flats and there is a potential for americium to be present without an association with plutonium But since most of the americium in soil (including the 903 B pad) is associated with plutonium, it is correct to use similar Kds for both elements A clarification of this topic should be made in the report, and references to Kd or other geochemical measurements should be inserted</p>	
32	<p>Page 19 Just above section IV 1 there is a statement EPA policy recommends against developing site specific probability distributions for human health toxicity values All Federal agencies have long used the linear non threshold approach to radiation effects on the assumption that the assumption prudently and conservatively addresses the possible effects of radiation at low doses This usage has been made in the full knowledge that this theory probably overestimates health effects Consequently the slope and dose conversion factors used in this study probably overestimate effects as well</p>	
33	<p>Page 28 There is considerable discussion about dose conversion</p>	

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	<p>factors and their usage as well as the selection of dosimetry from ICRP 60 and later publications The more recent dosimetry has not been accepted by Federal or State agencies for general use although their use has been approved on a case by case basis in a few instances No Federal agency (EPA, DOE NRC OSHA) has given public notice of the revision of its radiation protection rules to change rules from the dosimetry in ICRP 26 and 30 to that of ICRP 60 EPA has not withdrawn Federal Guidance Report 11 and 12 (which are based on ICRP 26 and 30 dosimetry) in favor of the more recent models All Federal agencies have agreed to use Federal Guidance Reports 11 and 12 for radiation protection purposes although the Federal Agencies lead by EPA are reevaluating the possible use of the ICRP 60+ dosimetry but have not made any general recommendations at this time So because of the difference in organ weighting factors (discussed in the second full paragraph on page 28) there is a potential for regulatory disconnects between different dosimetry models</p> <p>However the authors of this draft report have identified the reason for the fact that ICRP 60+ dosimetry is not used widely within the Federal government In the third full paragraph on page 28 they observe However the working group has examined the relative changes in these parameters and has concluded that the parameters being examined in detail would not have changed On a larger scale this is a succinct description of why ICRP 60+ dosimetry has not been embraced by the Federal government – there are very significant costs and very little benefit in the way of health protection And in the case of the RSALs it appears that the difference in dose factors does not change the RSAL in a significant way</p>	
34	<p>Page 30 In the discussion about the Outdoor Time Fraction parameter the correlation between the indoor and outdoor time fraction should have been a negative correlation, since as the text</p>	

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	indicates time spent outdoors cannot be spent indoors In the discussion on the Depth of Roots the choice of setting the depth of roots equal to the contamination thickness is proper because in the process of plowing and tilling the soil of a garden, the residual radioactivity would be homogenized throughout the thickness of the contaminated zone and the soil mixing layer	
35	Page 31 In the discussion of the Mass Loading for Inhalation parameter an assertion is made that recent air monitoring does not adequately represent potential perturbations to the annual mass loading that might be experienced by a future user at Rocky Flats Shouldn't the monitoring data reflect the ambient conditions? Have there not been wildfires both on and off site? Are there not a large number of vehicles driving onto the site with workers? Do these fires and vehicles not 'perturb' the airborne particulates at the site and introduce more dust into the air than would otherwise be present? After closure wouldn't the large number of vehicles traveling to and from the site decrease in a dramatic way? While the use of a distribution of values is prudent the text in the report is in need of some revision	
36	Page 42 In Section IV 6 there is no discussion of the rate of irrigation affecting airborne particulates If the site were to be irrigated at the assumed 1 meter per year rate the airborne dust would be significantly reduced	
37	Page 43 In the paragraph at the bottom of the page a better description of the administrative details of the wind erosion studies should be presented The text should read Under contract with [DOE Kaiser Hill etc] the xyz corp conducted a wind erosion study	
38	Pages 45-48 This discussion does not mention that EPA used ICRP 26 and 30 dosimetry to produce Federal guidance Reports 11 and 12 and that DOE and NRC have agreed to use the EPA reports for radiation protection purposes EPA has not issued any successor to those reports or announced their withdrawal from use	

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39	Page 48 In the last sentence of the first paragraph the text should read The current NRC State of Colorado EPA and DOE radiation regulations relevant to determining total effective dose equivalents are based on ICRP 30	
40	In the third paragraph of page 48 there needs to be an expansion of the discussion involving the inhalation class of plutonium The text might be something like disagree on this point (on the basis of environmental data at Rocky Flats and elsewhere DOE advocated use of the slowest absorption type S type but because EPA felt that this data did not provide absolute certainty M type should be employed for conservatism) All Parties	
41	Page 50 Just above section V 2 an assertion is made that the americium to plutonium activity ratio is 1527 What is the correlation coefficient for the linear regression of the data from the 903 B Pad characterization?	
42	Page 60 In the very last table entry on this page the failure of the EPA risk methodology to consider radioactive decay will definitely overestimate risk but probably not at Rocky Flats There are no significant short lived radionuclides and future ingrowth of radionuclides in decay chains is not significant Nonetheless the text should read that this 'will over estimate risk rather than is likely to over-estimate risk	
43	Page 61 Tables VI 1 VI 2 VI 3 VI-4 and VI 5 - the following concerns should be added to these tables as appropriate Assumption that there are foodstuffs available to a rural resident notwithstanding a simultaneous assumption that the assumed farm is denuded of vegetation Assumption that a heavily irrigated (1 meter per year) agricultural area is susceptible to fire to the same extent as unirrigated areas and that post fire dust levels in irrigated areas are also comparable to unirrigated areas Assumption that irrigation has no effect on vegetation regrowth after a fire	

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	Assumption that buildings (rural resident home and wildlife worker office) are not destroyed by fire despite all vegetation being burned Assumption that the establishment of buildings (and utilities sewer water gas electricity etc) will not mix bury and otherwise dilute and disperse residual radioactivity during construction	
44	Page 67 In the discussion of contaminated zone thickness the text should explain that plowing or tilling of soil for agricultural use will mix the soil and that 0.15 meters is a reasonable approximation for the depth of mixing	
45	Page 72 In the first table entry the word Work should be inserted before the word 'time'. The text should read <u>Time on site</u> . Worker is assumed to spend 100% of his/her work time on site within the approximately 300 acres that is contaminated above 10 pCi/g. Based on the data presented here the outdoor exposure for the wildlife workers should be evaluated for reduction.	
46	Page 72 In the discussion of the possibility of a day care facility for children, it is unlikely that there would be enough wildlife workers employed at the site to make an on site day care facility economically feasible. A provision for a day care facility for people not employed at a wildlife refuge is a commercial use not consistent with the proposed status of the site as a wildlife refuge.	
47	Page 74 There is an error in the stated RESRAD occupancy factors for Exposure Time and Indoor Time Fraction. For RESRAD there is no occupancy factor. For RESRAD the indoor time fraction for occupational exposure should be about 20 hours per week divided by 168 hours per week or 0.12 which represents the fraction of a year spent indoors on site.	
48	Page 75 In the discussion of Outdoor Time Fraction, the RESRAD parameter should be about 0.12 not 0.5. This input is the fraction of a year spent on site outdoors.	
49	Page 77 The assumption that an open space user will spend 100% of his/her time in 300 acres of a 6400 acre tract is overly conservative. The exposures should be scaled by dividing by a factor of 10 to	

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	account for this circumstance	
50	Page 79 The RESRAD Outdoor Time Fraction is not correct With the exposure defined as 100 visits per year and 2.5 hours per visit the total time is 5 hours per week or for the RESRAD input 0.03 (The RESRAD input is the fraction of a year spent on site outdoors)	
51	Page 82 The RESRAD Occupancy Factor and Indoor Time Fraction are not correct There is no occupancy factor in RESRAD The indoor time fraction will be 8 hours per day 50 weeks per year or 24 which is the fraction of a year spent on site indoors	
52	Appendix A Page 2 The thickness of the contaminated zone is appropriate set for 0.15 meter This is the likely depth for plowing and if one assumes agricultural use plowing is certain The same value for thickness of roots is appropriate with the understanding that this may overestimate root uptake of some crops	
53	Appendix A Page 3 Setting the soil mixing layer to 0.15 meters is appropriate if agricultural activities are assumed It is likely that plowing the soil would mix the soil over this depth	
54	Appendix A Page 5 In the discussion of mass loading of dust in the air it is possible that the dust in air at the site would decrease after closure because of the decrease in human and vehicular traffic There are presently hundreds of people and vehicles driving and walking through the site After closure this will greatly decrease Consequently there is a possible reduction in airborne dust from the current measured values after site closure This possibility should be discussed in this section.	
55	Appendix A There is a brief discussion about irrigation decreasing airborne dust for the rural resident The assumed irrigation will decrease dust by increasing the growth of vegetation and increasing soil moisture Further in the event of any fires irrigation would decrease the extent and severity of fires and irrigation would grow back much faster because the irrigation would facilitate the regrowth	

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	of plants	
56	Appendix A There has also been an extensive and commendable effort to identify airborne dust levels both near Rocky Flats and at other sites within Colorado This data is presented in summary form in Appendix F	
57	Appendix A Page 22 Are the concentration units mg/day throughout this table? The units should be shown	
58	Appendix A Page 51 As discussed above the possibility that a person is present on site for as much as 24 hours per day for 350 days per year is quite dubious While the parameter is handled in a probabilistic manner the distribution should be examined to verify that it is sound	
59	Appendix A Page 54 There is an extensive discussion of the exposure frequency for a wildlife worker However there is residual radioactivity in only a small portion of the site and it is incorrect to assume that all of the time on site is in an area where there is residual radioactivity	
60	Appendix B These equations do not account for radioactive decay This circumstance does not affect the calculations at Rocky Flats in a significant way	
61	Appendix C Page 1 in the first bullet, the shape affects the direct gamma radiation exposure pathway but not the other pathways For shapes other than circular and for exposure positions other than in the center the direct gamma radiation dose is lower Since direct gamma radiation is not significant at Rocky Flats this assumption does not have much of an effect	
62	Appendix C Page 2 In the second paragraph the discussion of the area correction factor is wrong There was a model change in the area factor' between RESRAD 5 61 and RESRAD 6 1 But since the area factor calculation is different between the two versions the conclusion of the paragraph is correct the results [of the previous work] are not directly comparable to the results of this task	

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63	Page 5 The input data includes distribution coefficients for Pu AM and U Were these measured? What is the reference?	
64	Appendix G The discussion on page 3 compares actual air monitoring data and the RAC modeling results This presentation is very helpful	

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Review Comments	Response
<p>pp 1 49 The table of dose and risk calculations for various scenarios needs to show numbers for the resident rancher under the CERCLA risk levels in order to make the resident rancher scenario readily comparable to risk calculations for the other scenarios Also it would be valuable to have a column for the 15 mrem/y dose level used in 1996 by RAC in 2000</p>	
<p>p 4 ¶2 Correct principle to principal</p>	
<p>p 7 There is nothing specifying the number of years the refuge worker is expected to work at the site (this info is given on p 16)</p>	
<p>p 9 Re the rural residential scenario is it realistic to assume this person will be on the site 24 hours/day for up to 350 days/year but outdoors no more than 20% of the time?</p>	
<p>pp 17 17 More detail and documentation is needed to support the assertion that onsite water would not be used under any scenario considered Could damming of streams provide enough water? Could this be supplemented by wells? One thing clear here is that the scenario selection precludes adequate attention to the to the water use question What would it look like to calculate possible water use for the resident rancher or subsistence farmer scenario?</p>	
<p>p 18 III 3 David Janecky at a recent AME meeting said he had found unusually high concentrations of Am in certain areas of the site I gathered from his presentation that the Am about which he spoke is above and beyond what would show up as daughter product of weapons grade Pu Does the sum of ratios method for calculating RSALs account for these unusually high levels of Am?</p>	
<p>p 18 final sentence This sentence suggests that no adverse effects can be expected from movement of Pu in shallow groundwater Isn t movement of Pu in shallow groundwater a possible source of the 1997 exceedances to the state s Pu in —surface water standard?</p>	
<p>p 21 lines 3 and 4 and elsewhere Please explain and demonstrate what is meant by selection of “a health protective point estimate</p>	

Summary of End State Options – Surface Contamination

RFCA Stakeholder Focus Group

January 9, 2002

The Situation

- Surface contamination exists almost exclusively in Buffer Zone
- Very little surface contamination in Industrial Area

HOLISTIC VIEW NOTE (Water Protection) Pu has been found in surface water in Industrial Area Cleanup of surface contamination in Industrial Area may be needed for water protection

Baseline Assumptions

- Surface Cleanup will be based on RSAL of 651 pCi/g
- Cleanup will affect 5 acres in Buffer Zone
- Cleanup will generate 11 000 m³ of Low Level Waste and Low Level Mixed Waste
- Small quantities of TRU waste may be generated

Surface Cleanup To Be Conducted Under All Scenarios (Not Optional)

Summary of End State Options – Surface Contamination



- 903 Pad Cleanup
 - All contamination will be removed
 - Attempt will be made to avoid generating TRU waste
 - Estimated cost = \$30.5 million

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Summary of End State Options – Surface Contamination

- B Series Pond Sediments
 - Contaminated pond sediments will be removed from Ponds B 1 B 2 and B 3
 - Estimated cost = \$?

Surface Cleanup Activity Where Cleanup Options Exist

- 903 Lip Area

Bounding Options for 903 Lip Area

- Cleanup to 500 pCi/g
 - Area 5 15 acres (closer to 5 acres)
 - Cost ~\$40 million+
 - Health Risk $\sim 10^{-4}$ to Wildlife Refuge Worker
 - Ecological impacts Minimal restoration after cleanup
 - Stewardship Monitoring will be required may require administrative and engineered controls risk of needing additional cleanup
- Cleanup to 50 pCi/g
 - Area ~50 acres
 - Cost ~\$80 90 million
 - Health Risk $\sim 10^5$ to Wildlife Refuge Worker
 - Ecological impacts Significant impacts to ecosystem begin to occur significant disruption and system restoration begin
 - Stewardship Monitoring will be required may require administrative and engineered controls risk of needing additional cleanup
 - Other Industrial risks to remediation / waste / transportation workers increase
- Cleanup to 5 pCi/g
 - Area ~1 500 acres

Summary of End State Options – Surface Contamination

- Cost \$? (would 1 500 X [\$80 million/50 acres] = \$2 4 billion be approximate – crh?)
- Health Risk ~ 10^6 to Wildlife Refuge Worker
- Ecological impacts Severe impacts to ecosystem occur substantial disruption and system restoration required
- Stewardship Monitoring will be required engineered controls may not be needed very low risk of needing additional cleanup
- Other Industrial risks to remediation / waste / transportation workers increase

Ideas for Reducing Cleanup Costs to Allow More Extensive Cleanup

- Store waste below a selected contamination level onsite in monitored but not very retrievable form (e g building basements)
- Store waste below a selected contamination level onsite in traditional Monitored Retrievable Storage site
- Identify a way to remove a thinner layer of surface soil (less than the currently assumed 6 inches) when remediating
- Use alternative technology (e g vacuuming) for areas where practical

903 Lip Area Cleanup Options to Characterize and Consider for End State Discussion

- Cleanup to 500 pCi/g with offsite disposal
- Cleanup to 500 pCi/g with onsite disposal
- Cleanup to 50 pCi/g with offsite disposal
- Cleanup to 50 pCi/g with onsite disposal
- Cleanup to 5 pCi/g with offsite disposal
- Cleanup to 5 pCi/g with onsite disposal

Additional Information Needed for Surface Contamination Discussion

- Breakdown of \$40 million cleanup cost in Baseline Budget
- Explanation of why estimate of cost for cleanup to 35 pCi/g RSAL has risen from \$75 million to \$82 million
- Breakout of 903 Pad cleanup costs
- Kriging Map for sum of ratios radioactive surface contamination
- Better (but still rough) cost breakouts for the options
- Conceptual description of onsite monitored retrievable storage and onsite monitored not very retrievable storage
- Regulatory impacts of options (especially onsite storage options)

SURFACE CONTAMINATION

Holistic Summary

RFETS End State Options

Option	Subsurface Contamination	Water Protection	Stewardship
903 Pad Full Cleanup B Series Pond Sediments Full Cleanup	No impact No impact	Fully protects water quality Fully protects water quality Additional cleanup may be required in specific locations to protect water quality specifics TBD	Monitoring will be required Monitoring will be required Monitoring will be required Administrative and/or engineered controls likely to be required Additional cleanup may be required Monitoring will be required Administrative and/or engineered controls likely to be required Additional cleanup may be required Maintenance of storage facility required Periodic long term redesign / rebuilding of storage facility will be required Removal of stored materials may be required Monitoring will be required Administrative and/or engineered controls may be required Additional cleanup may be required Monitoring will be required Administrative and/or engineered controls may be required Additional cleanup may be required Maintenance of storage facility required Periodic long term redesign / rebuilding of storage facility will be required Removal of stored materials may be required
903 Lip Cleanup to 500 pCi/g With Offsite Storage	No impact		
903 Lip Cleanup to 500 pCi/g With Onsite Storage	Potential for leakage and groundwater contamination must be controlled and monitored specifics TBD	Additional cleanup may be required in specific locations to protect water quality specifics TBD	
903 Lip Cleanup to 50 pCi/g With Offsite Storage	May limit subsurface contamination cleanup due to funding trade offs specifics TBD	Additional cleanup may be required in specific locations to protect water quality specifics TBD	
903 Lip Cleanup to 50 pCi/g With Onsite Storage	May limit subsurface contamination cleanup due to funding trade offs specifics TBD	Additional cleanup may be required in specific locations to protect water quality specifics TBD	

RFETS End State Options

Holistic Summary

SURFACE CONTAMINATION

903 Lip	Cleanup to 5 pCi/g With Offsite Storage	May limit subsurface contamination cleanup due to funding trade offs specifics TBD	Will probably be fully protective of water quality specifics TBD	Monitoring will be required Administrative and/or engineered controls unlikely Additional cleanup unlikely Monitoring will be required Administrative and/or engineered controls unlikely Additional cleanup unlikely Maintenance of storage facility required Periodic long term redesign / rebuilding of storage facility will be required Removal of stored materials may be required
903 Lip	Cleanup to 5 pCi/g With Onsite Storage	May limit subsurface contamination cleanup due to funding trade offs specifics TBD Potential for leakage and groundwater contamination must be controlled and monitored specifics TBD	Will probably be fully protective of water quality specifics TBD	

Excess Cancers among Workers Exposed to Plutonium on the Job at Rocky Flats
by LeRoy Moore Rocky Mountain Peace & Justice Center (January 2002)

In 1987 Gregg S. Wilkinson of DOE's Los Alamos Lab published results of a study of Rocky Flats workers that presented the first epidemiological findings suggesting that exposure to plutonium produced adverse health effects.¹ Wilkinson divided the 5413 workers he studied into three groups: the *more exposed* (those with a plutonium body burden of 5 or more nanocuries [nCi]), the *less exposed* (those with a body burden of from 2 to 4.9 nCi) and the *unexposed*. Both the less exposed and more exposed workers showed no significant increase in cancers of the liver, bone and lung—organs of the body where plutonium is known to accumulate. But both groups showed surprising increases in a wide range of other cancers. Excess brain cancers were found among both the less exposed and more exposed.

DOE's occupational standard for plutonium is a maximum permissible body burden of 40 nCi. Many of the workers Wilkinson studied had body burdens considerably below this level. Because 2 nCi, a mere 5% of DOE's standard for permissible exposure, was the lowest level his instruments could detect with certainty, Wilkinson classified as unexposed all workers with a body burden of less than 2 nCi. Any cancers among workers burdened at this very low level were not counted as possibly due to occupational exposure. Wilkinson thus thought his study underestimated the true effect of plutonium exposure.

As soon as his results began to be known, his study created a firestorm of controversy within DOE. A physician on the Los Alamos staff told him that his findings, if true, would shut down the nuclear industry.² His supervisor at Los Alamos urged him to modify his findings prior to publication to please the customer,³ that is DOE. When he published his results without change in the *American Journal of Epidemiology* in 1987, his Los Alamos work was downgraded and subjected to increased levels of internal review, making future research more difficult and publication less likely. In response, he resigned. His colleague George Voelz, one of the eight co-authors of the Wilkinson study, was moved into the position Wilkinson vacated.

In a recent article in *Los Alamos Science*, Voelz presents what purports to be a comprehensive review of what is now known about risk from exposure to plutonium. Wilkinson's study of Rocky Flats workers, he says, showed no evidence of statistically increased rates of lung, liver and bone cancers.⁴ Voelz makes no mention of what made the Wilkinson study so controversial in the first place, namely the finding of elevated levels of other cancers among workers with plutonium exposure at very low doses. Voelz brings the scandal surrounding Wilkinson's work right up to date. Wilkinson now chairs the Department of Epidemiology and Biostatistics at the University of North Texas at Fort Worth.

Having heard Wilkinson's Rocky Flats study dismissed as inadequate because he did not consider data on the use of tobacco among the workers he studied, I asked Wilkinson about this. He pointed out first that data on tobacco use would be pertinent for lung cancer but not for other cancers. Second, the potential relationship between smoking, plutonium lung burden and lung cancer should be studied. In fact, while he was at Los Alamos, he had drafted a proposal to seek National Cancer Institute funding for research in this area, but DOE officials would not allow the proposal to be sent to the NCI for review.⁶

Gregg S. Wilkinson et al. Mortality among Plutonium and Other Radiation Workers at a Plutonium Weapons Facility. *American Journal of Epidemiology* 125: 2 (1987) 231-250.

²Wilkinson. Seven years in search of alpha. The best of times, the worst of times. *Epidemiology* 10 (1999).

³Keith Schneider. Panel Questions: Credibility of Nuclear Health Checks. *The New York Times*, February 28, 1990.

Wilkinson. Seven years in search of alpha. *Epidemiology* 10 (1999).

⁵George L. Voelz as told to Ileana G. Buican. Plutonium and Health: How great is the risk? *Los Alamos Science* No. 26 (2000) 85.

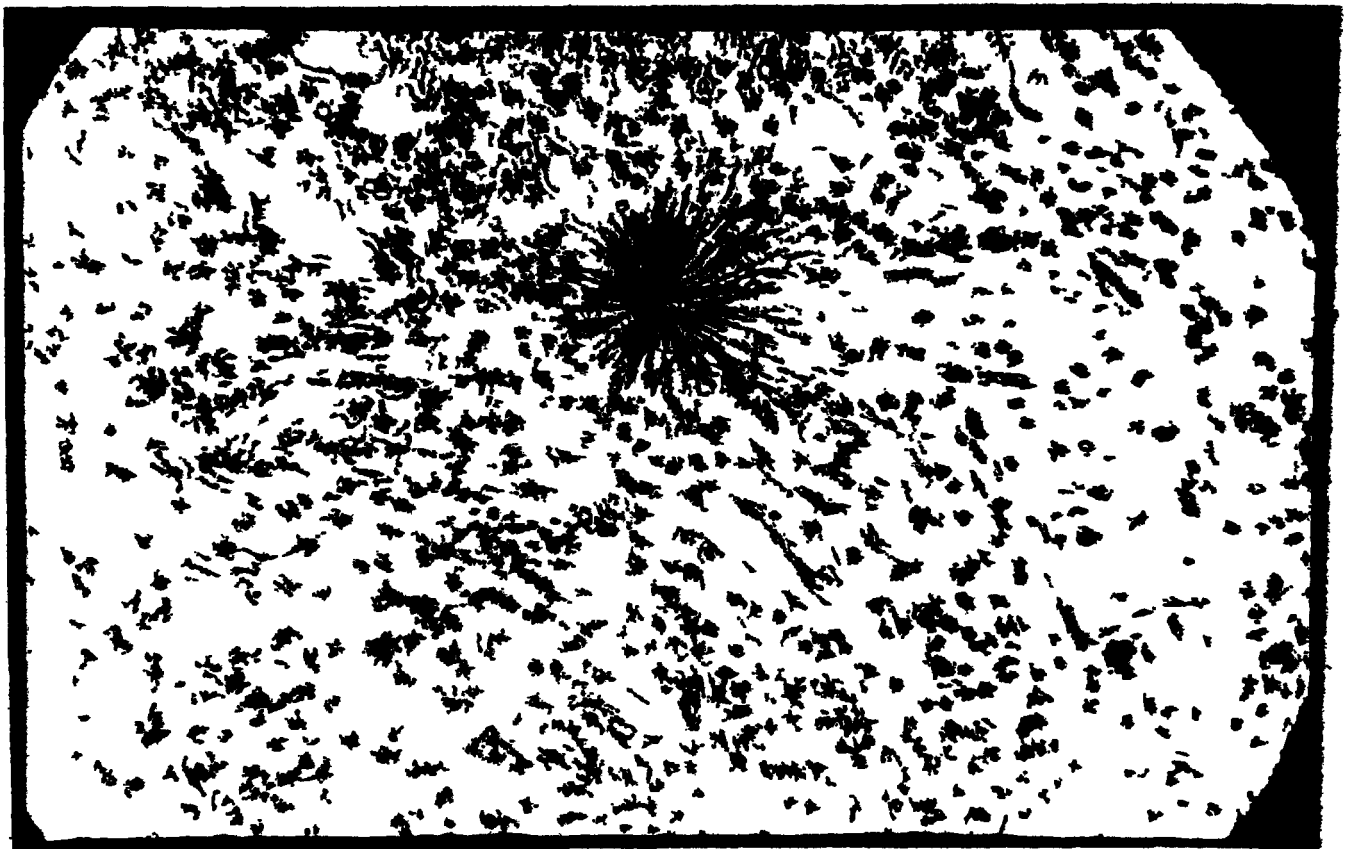
⁶Wilkinson to Moore, April 26, 2001.

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Risk from Plutonium in the Environment at Rocky Flats
Prepared by LeRoy Moore Ph.D. Rocky Mountain Peace and Justice Center
(January 2002)

♦ Plutonium 239 the material of principal concern at Rocky Flats has a half life of 24 400 years It remains dangerously radioactive for more than a quarter of a million years Left in the environment it poses an essentially permanent danger

♦ The alpha radiation emitted by plutonium cannot penetrate skin like gamma radiation or x rays But minuscule particles of plutonium taken into the body by inhalation ingestion or through a wound continue to emit alpha radiation Plutonium thus lodged in the body can cause cancer genetic defects damage to the immune system



♦ The black star in the middle of this picture shows the tracks made by alpha rays emitted from a particle of plutonium 239 in the lung tissue of an ape The alpha rays do not travel very far but once inside the body they can penetrate more than 10 000 cells within their range This set of alpha tracks (magnified 500 times) occurred over a 48 hour period (Robert Del Tredici *At Work in the Fields of the Bomb* [1987] plate 39 photographed at Lawrence Radiation Laboratory Berkeley California 9 20 82)

♦ Internal alpha emitters like plutonium are much more harmful per unit dose than penetrating gamma radiation To account for the difference the International Commission on Radiological Protection (ICRP) and other bodies refer to the relative biological effectiveness (RBE) of alpha emitters Looking at the potential harm to different organs and for different disease end points ICRP comes up with an average RBE for alpha emitters of 20 This means that on average internal alpha emitters are 20 times more harmful than

external gamma radiation of the same dose But because 20 is an average for some end points and for some exposed individuals the actual RBE is much higher Those responsible for calculating soil action levels for plutonium in the Rocky Flats environment follow the ICRP and use 20 as the RBE for plutonium This averaging approach underestimates some of the harm that may result from plutonium exposure Doubling the plutonium RBE to 40 would cut the final soil action level by half (For a thorough discussion of plutonium RBE, see Helen A Grogan et al *Assessing Risk of Exposure to Plutonium* Revision 2 February 2000 Health Studies on Rocky Flats [Radiological Assessment Corporation for Colorado Department of Public Health and Environment] pp 6 27 - 6 39)

♦ A British research team headed by Eric Wright concluded that the RBE for chromosomal damage from plutonium exposure is essentially infinite The reason Wright and his colleagues used the term infinite is that they were referring to permanent damage to the human gene pool the extent of harm passed on to future generations is incalculable (*Nature* 355 20 [Feb 1992] 738 740)

• Data from research done by Tom K Hei of Columbia University and his colleagues demonstrates that a single plutonium alpha particle induces mutations in mammal cells They found that cells irradiated by very low doses of alpha radiation were more likely to be damaged rather than destroyed that replication of these damaged cells constituted genetic harm and that more such harm per unit dose occurred at very low doses than would occur with higher dose exposures These data provide direct evidence that a single alpha particle traversing a nucleus will have a high probability of resulting in a mutation and highlight the need for radiation protection at low doses (*Proceedings of the National Academy of Sciences* 94 [April 1997] 3765 3770) In a follow up study these same researchers found that a single alpha particle can induce mutations and chromosome aberrations in [adjacent] cells that received no direct radiation exposure to their DNA That is they observed a huge bystander mutagenic response in neighboring cells (*Proceedings of the National Academy of Sciences* 98 [4 Dec 2001] 14410 14415)

♦ In 1987 Gregg S Wilkinson of DOE's Los Alamos Lab published results of his study of Rocky Flats workers exposed to plutonium on the job Workers who developed a variety of cancers in excess of the general norm had internal plutonium deposits well below DOE's permissible lifetime plutonium body burden (*American Journal of Epidemiology* 125 2 [1987] 231 250)

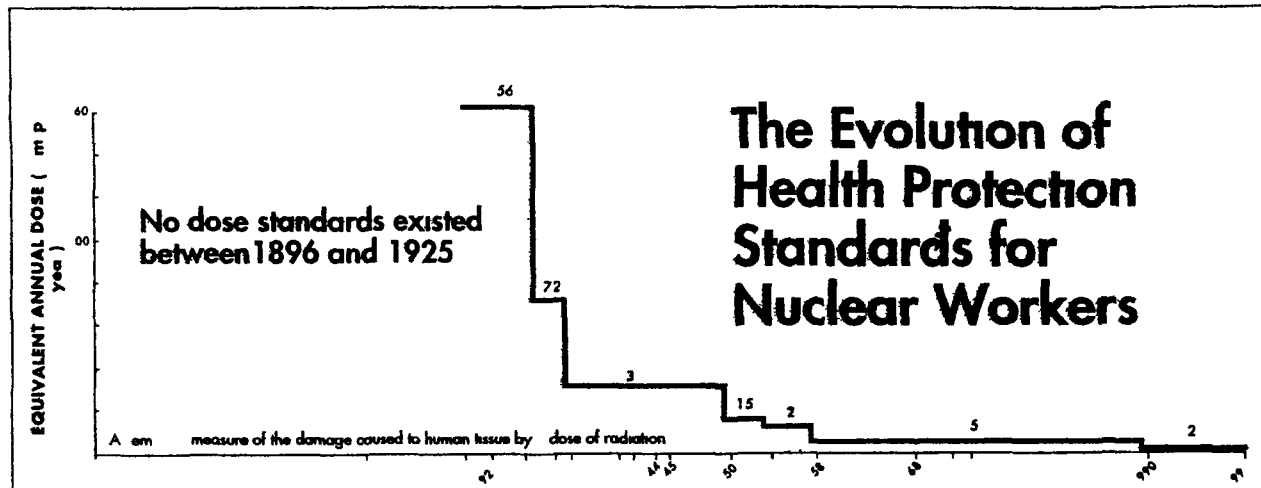
♦ In the Rocky Flats environment plutonium will be in very fine particle form a form that can be inhaled or ingested but that also can migrate It can be resuspended in respirable size by wind or it can be transported in water by plant processes or by the actions of worms insects birds animals

♦ No one knows plutonium's long term effect on various life forms particularly with respect to genetic coding (See D T Tautz *Trends in Genetics* 16 [Nov 2000] 475 477)

♦ In the long term future wholly unpredictable geophysical changes could bring to the surface plutonium left below the surface in the Rocky Flats environment

♦ There is no guarantee that plutonium left in the Rocky Flats environment will remain on the site People downwind and downstream of Rocky Flats have a right to be concerned about decisions not to remove as much of this material as possible from the Rocky Flats environment

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There is no single set of radiation protection standards. This graph is based on recommendations, sometimes different, published by several U S and international groups concerned with radiation protection. They have been translated into a single, consistent set of numbers and measurement units for the purpose of this summary. The science of radiation protection was dubbed 'health physics' by the Manhattan Project.

1896 Henri Becquerel discovers radiation. First radiation is reported, but no protection standard exists.

1915 Protection standards describing safe practices for handling radium and X-ray machines are published. Sweden and Germany radiologists were advised to stay as far away from the equipment as possible to handle radium vials with long gloves to work no more than 35 hours a week. The U S and Britain soon follow suit, but no dose limits are set because measurement techniques and units do not yet exist.

1925 Swedish and German scientists publish estimates of total doses. The amount of radiation a person was thought to absorb without harm. Based on the amount of radiation that would be likely to be tolerated, the dose was initially estimated to be the equivalent of about 156 rem per year (over 45 times the current standard), although the estimates varied widely.

1928 The first internationally accepted X-ray protection standard, 10 rems per month, is adopted at an international congress.

1931 The tolerance dose standard is set at 6 rem per month (72 rem per year).

1933 The genetic effects of radiation on fruit flies are studied by German scientist A. Mueller. He learned that radiation caused genetic mutations.

1934 First international radiation safety standards based on measurement of damage to human tissue are published. Zehval by the International Commission on X-Ray and Radium Protection. Worker allowed up to 0.1 rem per day (30 rem per year).

1941 Recommended tolerance for gestated and monthly radiation limits are set by the National Commission on Radiation Protection. The recommendation is based on studies of radon-watch-dial painters.

1942 The Manhattan Project begins. The 1934 radiation exposure limit of 30 rem per year are accepted by the University of Chicago Metallurgical Laboratory after experimental verification. The tolerance concept is discarded for the maximum permissible exposure.

1944 The initial tolerance limit for plutonium inhalation is set at 5 mP/Year by the Manhattan Project's radiation protection laboratory.

1945 The first atomic bombs are produced, tested, and used. Weighting factors for the different types of radiation are introduced to account for their different health effects. The plutonium tolerance limit is lowered to 1 mP/Year of a gram per person.

1950 Scientists discard the idea of a maximum permissible exposure, recognizing that any amount of radiation may be dangerous. Radiation protection scientists recommend that exposure be as low as reasonably achievable. Concern over latent cancer, life shortening, and genetic damage also causes standards to be lowered: 0.3 rem per week (15 rem per year).

1954 A quarterly limit of 3 rem per 13 weeks (12 rem per year) is introduced by the U S National Bureau of Standards to allow more flexibility in exposure patterns. Workers are still allowed 0.3 rem per week up to this limit.

1958 In response to a study by the National Academy of Sciences of the genetic effects of radiation, a new dose limit is introduced, singling out a group that allows workers to receive 5 rem per year after the age of 18. Annual doses are allowed to exceed this level up to 3 rem per 13 weeks (12 rem per year). To protect the gene pool, lower limits of 0.5 rem per year are set for the general public.

1968 The Federal Government updates its protection standard to the 5 rem per year recommended in 1958. The standard has not been changed since.

1971 Radiation protection standard restated by the National Commission on Radiation Protection but not really changed. 3 rem per 13 weeks in the past, 5 rem per year in the future. By including exposure from internal radiation (body burden), the standard is effectively lowered by a significant amount.

1972 The National Academy of Sciences publishes its first study of the health effects of radiation since 1956. The report *Biological Effects of Ionizing Radiation I (BEIR I)* becomes the first of a series.

1990 The National Academy of Sciences BEIR V report asserts that radiation is almost 10 times as damaging as estimated by BEIR I. Annual doses may no longer exceed 5 rem per year. An average of 1 to 2 rem per year is recommended by the International Commission on Radiation Protection.

**CHANGING U S RADIATION
EXPOSURE STANDARDS 1934 2001**

Maximum permissible whole body doses
of external radiation (above background)

Occupational exposure

1934	30 rem/year
1949	15 rem/year
1957	5 rem/year
(1987 [Britain])	1 5 rem/year)
1990	2 rem/year

General public exposure

1956	0 50 rem/year†
1960	0 17 rem/year
1987	0 10 rem/year

recommended not adopted as of end of 2001
†0 50 rem = 500 millirem To protect the gene
pool the limit for the general public is set at
a reduced level at 10 / of the occupational
limit until 1987 when it was reduced to 5 /
of the recommended occupational limit

(The above is drawn from Michael McCally
What the Fight Is All About *The Bulletin of
the Atomic Scientists* [September 1990] p 12
Catherine Caufield *Multiple Exposures* (Chicago
University of Chicago Press 1989) p 249
and U S DOE *Closing the Circle on the Splitting
of the Atom* [1995] p 38)

Prepared by LeRoy Moore
Rocky Mountain Peace and Justice Center
(January 2002)

HEALTH PHYSICS

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730

Health Physics

December 2001 Volume 81 Number 6

PUBLIC INVOLVEMENT IN SCIENCE AND DECISION MAKING?

Dear Editors

I RECENTLY looked over the article, "Public Involvement in Science and Decision Making" in the April 2001 issue of *Health Physics*. I take exception to the statement under Background, because these levels had been developed with little public input. This position has been repeated by a segment of the public that wanted the level to be lower; however, there was extensive public input to these interim values, including workshops, presentations and individual meetings. I do not disagree that public pressure caused the reevaluation described.

I also note that the next to the last paragraph in the conclusions is overwhelmingly self-congratulatory about

support for the soil action level ultimately derived. I have asked members of the panel if they would accept using the number as an action level and find that they would unless a lower number could be found elsewhere.

My belief is that the author gave them what they wanted—a lower number—rather than science that they could support. Sometimes science gives unpopular answers. As a regulator and a scientist, I sometimes have to implement sound decisions even if they are unpopular.

STEVE TARLTON

Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver CO 80246-1530

RESPONSE TO TARLTON

Dear Editors

I APPRECIATE Mr. Tarlton's comments on our paper. Based on a wide cross section of individuals with whom I spoke about public involvement in setting the interim standards, my description about limited meaningful public involvement is correct. Further, this aspect of the work was not addressed in the report issuing the interim standards. Perhaps the best evidence that there was little public input is, as Mr. Tarlton states, public pressure led to the reevaluation of the cleanup standards.

With regard to recommending a lower number than science could support, I strongly disagree. Our work was extensively peer reviewed by an independent peer review team, and also by the individuals from the Department of Energy, the Environmental Protection Agency, and the Colorado Department of Public Health and Environment in addition to members of the Oversight Panel. It has been further reviewed by a special workshop to consider the science we applied. Although our approach employed the RESRAD code as the basic structure of our approach, we adopted a number of unique modifications to account for (1) the heterogeneity of radionuclide concentrations in soil around the site, (2) uncertainty in predictions of dose, (3) additional exposure scenarios, and (4) the possible occurrence of a large grass fire. Further, we tried to incorporate all of the data available to make the estimates of cleanup level as specific to the site as possible. As we stressed throughout the project, it is the technical approach taken and the public

process that we believe are important, not the cleanup value itself. The value we derived could change depending on changes to our methods or data others may introduce.

As anyone who participated in the process is aware, throughout the period of the project, we were working with the Oversight Panel to select models, input parameters, and explaining our methodology. It was not until near the end of the project that we made our first estimates of a cleanup level for plutonium. Neither the Oversight Panel nor we knew what the outcome of the calculations would be until after we had developed our models and selected input data. Therefore, to suggest that we gave them what they wanted is simply not correct.

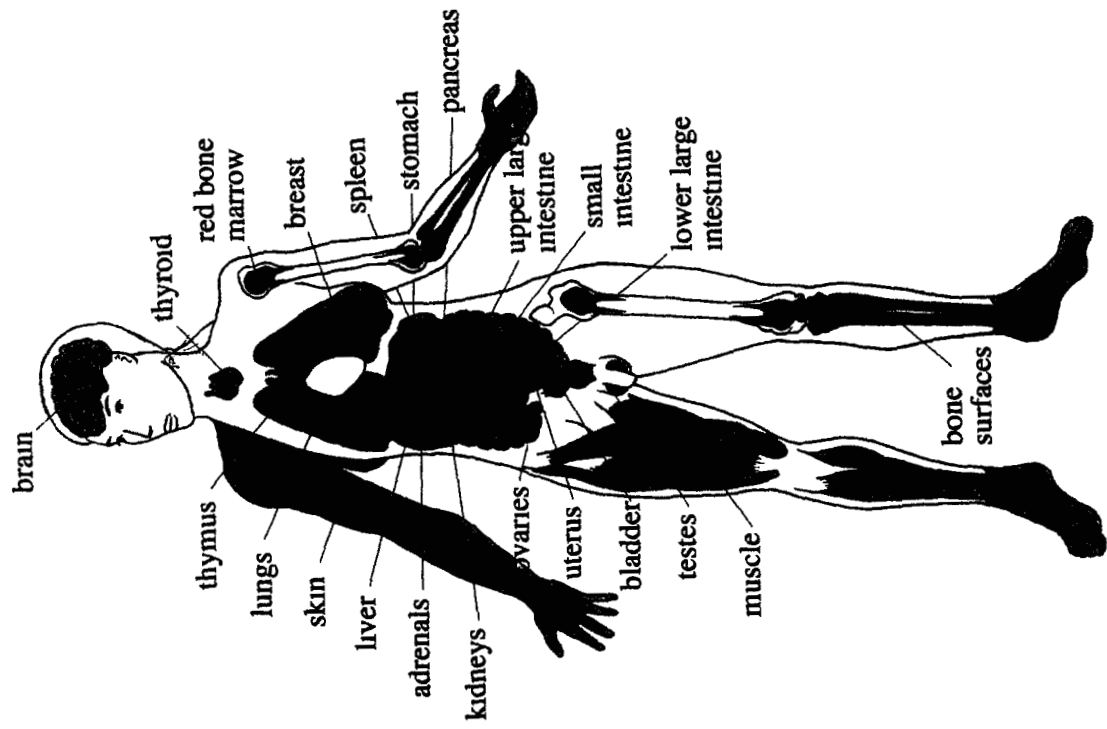
Finally, as we stated in our conclusions, the final decision on setting a level for cleanup at Rocky Flats ultimately lies in the hands of the stakeholders: Federal and State authorities, and the community working together to arrive at a value that provides long-term protection of the public regardless of the ultimate use of the site. What we did was to propose a methodology that could be used; a value for cleanup to be considered, and, most importantly, to demonstrate the importance of making it a public process.

JOHN E. TILL

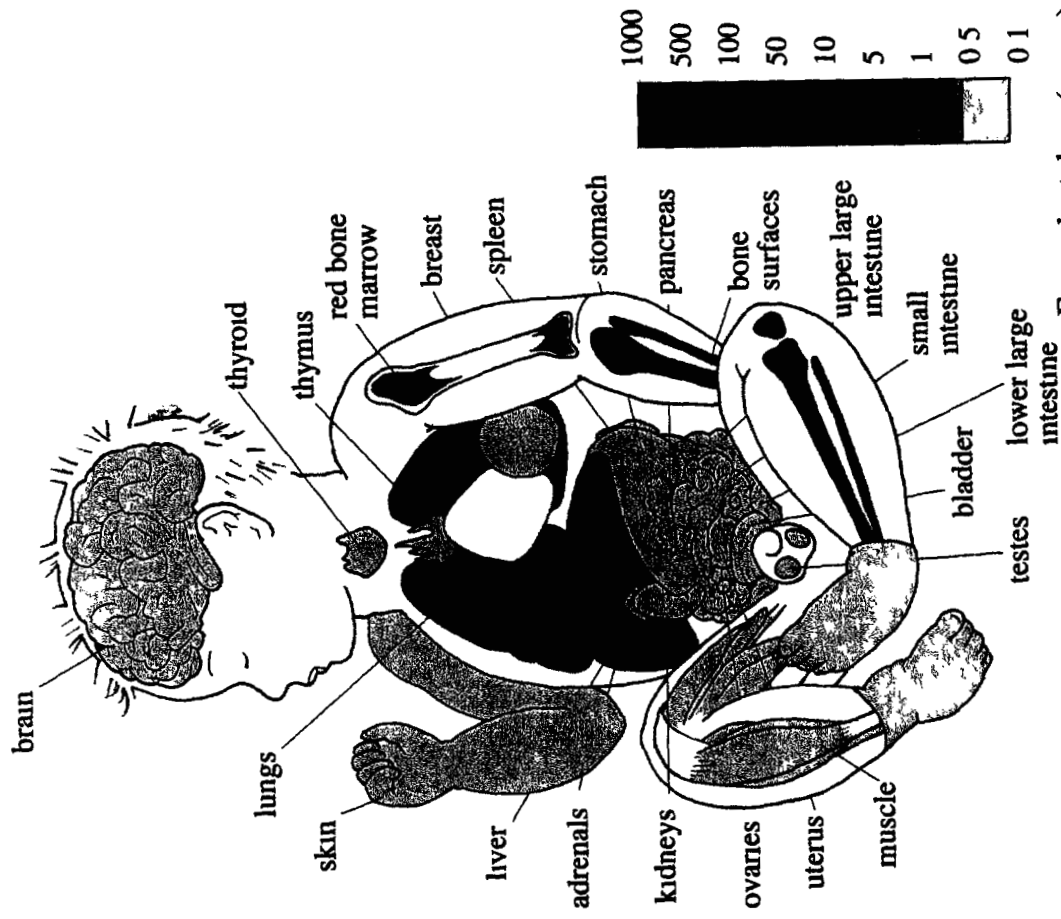
Risk Assessment Corporation
417 Till Road
Neeses SC 29107

■ ■

Organ doses from one day of exposure to an air concentration of 1 Bq/m³



adult



infant

Equivalent dose (mrem) to
age 70 years

(values derived from RAC report No 5-CDPHE RFP 1998 FINAL (Rev 2) (2000) Assessing Risks of Exposure to Plutonium)

RFCA Stakeholder Focus Group Attachment C

Title	Meeting Minutes for August 22 and September 5 2001 Meetings
Date	February 13, 2002
Phone Number	(303) 428-5670
Email Address	cbennett@alphatrac.com

**Participation List for
RFCA Focus Group Meeting of 08/22/01**

First	Last	Company Organization
David	Abelson	RFCLOG
Mark	Aguilar	EPA
Melissa	Anderson	RFCLOG
Christine	Bennett	AlphaTRAC Inc
Kent	Brakken	U S DOE RFFO
Kimberly	Chleboun	RFCLOG
Carol	Deck	Kaiser Hill Co LLC
Rick	DiSalvo	US DOE RFFO
Sam	Dixon	
Shirley	Garcia	City of Broomfield
Joe	Goldfield	RFSALOP
Susan	Griffin	EPA
Steve	Gunderson	CDPHE
Mary	Harlow	City of Westminster
Jerry	Henderson	RFCAB
Reed	Hodgin	AlphaTRAC Inc
Victor	Holm	RFCAB
Carol	Lyons	City of Arvada
Sandi	MacLeod	U S DOE
Tom	Marshall	Rocky Mountain Peace and Justice Center
LeRoy	Moore	RMPJC
Carla	Rellergert	Weston
Mark	Sattelberg	US Fish and Wildlife Service
Kathy	Schnoor	City of Broomfield
Joel	Selbin	
Dave	Shelton	Kaiser Hill Company LLC
Carl	Spreng	CDPHE
Noelle	Stenger	RFCAB
Honorable Hank	Stovall	City of Broomfield

RFCA Stakeholder Focus Group

August 22, 2001

Meeting Minutes

INTRODUCTION AND ADMINISTRATIVE

A participants list for the August 22 2001 Rocky Flats Cleanup Agreement (RFCA) Stakeholder Focus Group meeting is included in this report as Appendix A

Reed Hodgins of AlphaTRAC Inc meeting facilitator reviewed the purpose of the RFCA Focus Group and reinforced the meeting rules Introductions were made

AGENDA

Reed Facilitator reviewed the agenda

- Summary Description of Land Use Scenarios and Associated Modeling Parameters
- Briefing on New Results in the RSALs Modeling Matrix
- RSALs Task 3 Continued Technical Discussion Pathway Contributions to Model Results
- RSALs Task 3 Continued Technical Discussion Soil Ingestion Rate
- RSALs Task 3 Continued Technical Discussion Scenario Parameters Exposure Frequency and Exposure Duration
- Wind Tunnel Discussion

RFCA MEETING MINUTES DATED JUNE 20 AND JULY 11, 2001

There were no comments from the Focus Group regarding the June 20 2001 meeting minutes

The RFCAB asked that the July 11 2001 meeting minutes be amended to reflect the discussion on As Low As Reasonably Achievable (ALARA) analysis and its applicability to Radionuclide Soil Action Level (RSAL) and cleanup levels This discussion will be reflected in July 11 2001 Revision 1 meeting minutes and will be sent under separate cover

SUMMARY DESCRIPTION OF LAND USE SCENARIOS AND ASSOCIATED MODELING PARAMETERS

Steve Gunderson Colorado Department of Public Health and Environment (CDPHE) stated that Tom Pentacost provided RESRAD modeling results using 25 mrem/yr dose values for two additional scenarios

TS

- 1 Open space user
- 2 Office user

These results were emailed to Focus Group members recently Steve indicated that results from the existing binding scenarios continue to establish criteria for the (RSALs)

Susan Griffin U S Environmental Protection Agency (EPA) Toxicologist commented that the office worker parameters were still being developed and hoped to work on them the week of August 22 2001 Additionally Jim Bennett is working on the RAC scenario (subsistence rancher) to determine how RESRAD model results differ from RAC results This data should to be available in two weeks

Steve further added that the RESRAD results for the additional scenarios were high which is consistent with the RAC modeling results RSAL values using a 25 mrem dose limit are as follows

- 1 Open space user (adult) <8 000 pCi/g
- 2 Open space user (child) ~5 000 pCi/g
- 3 Office worker 2 300 pCi/g

CDPHE does not intend on using these risk numbers as the ultimate level rather as management and tier discussions are held these results may have value The residential and wildlife refuge worker scenarios should continue to be the primary scenarios to establish RSALs

RSAL S TASK 3 CONTINUED TECHNICAL DISCUSSION - PATHWAY CONTRIBUTIONS TO MODEL RESULTS

Steve Gunderson CDPHE presented preliminary RESRAD model results titled *Dose Contributions from Individual Exposure Pathways at 95 / Probability* Three scenarios were documented using the 25 mrem dose limit of two radionuclides (Plutonium and Americium)

The scenarios are as follows

- Residential adult (Pu)
- Residential adult (Am)
- Residential child (Pu)
- Residential child (Am)

- 1 Open space user
- 2 Office user

These results were emailed to Focus Group members recently Steve indicated that results from the existing binding scenarios continue to establish criteria for the (RSALs)

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- Residential adult (Pu)
- Residential adult (Am)
- Residential child (Pu)
- Residential child (Am)

Bob explained that the mass loading for ingestion pathway is 2.5 times higher than the mass loading for the inhalation pathway based on the ICRP 72. Additionally, mass loading in the model for inhalation (PM^{10}) is calculated at the 95th percentile using a statistical distribution. The statistical distribution of mass loading ranges from 10 $\mu\text{g}/\text{m}^3$ to 200 $\mu\text{g}/\text{m}^3$.

Participants of the Focus Group continued to express discomfort with the new DCF and risk values. One participant noted that the research regarding plutonium continues to change assumptions. CDPHE added that one of the biggest distinctions between ICRP 30 and 72 is that ICRP 72 is applicable to environmental exposure to the public as well as exposure to the worker.

The Focus Group further discussed caveats related to parameter sensitivity in the model and pathway analyses. The desire was to use pathway analyses to focus on the most important pathways to evaluate as a group.

Bob commented that a sensitivity analysis has been conducted and the pathway of exposure has remained an overarching and critical parameter.

Reed noted that the data resulting from the new DCF is not a new topic for the Group and that the results need to be continuously defended through further discussion.

The Focus Group further discussed the implications of the resident rancher scenario. A key point was that impacts on animals through ingestion were negligible and the focus will remain on human health impacts.

The Focus Group discussed the possibility of modeling RESRAD real time to get a sense of the degree of sensitivity of a parameter such as mass loading. Bob explained that there is a direct correlation between doubling dose from any pathway and the percentage of total dose. The Group agreed to attend a special session on RESRAD modeling.

The Focus Group closed out this discussion with an important point: the combination of the sensitivity of a parameter and *what* the contribution of the pathway indicates are important to the analyses. The Task 3 report may respond to this and the continued work on the scenarios such as the child via ingestion pathway.

TASK 3 QUESTIONS FROM THE FOCUS GROUP

Soil Ingestion and Exposure Duration

Susan Griffin EPA responded to questions regarding soil ingestion. She stated that as a part of establishing RSALs an analysis of inputs outputs and formulas would be conducted. In the event that site specific data cannot be used as inputs then national data will be used to develop distributions. From that analysis a methodology will be drafted to evaluate if the data are representative of the population specific to Rocky Flats and if the distribution is valid. Currently the focus is on the representativeness of the datasets. Generally the data sets used do not precisely represent the populations being modeled. This is particularly true for hypothetical scenarios such as the wildlife refuge worker. The goal is to find a surrogate data set that will adequately represent the population—well enough to have useable results.

One issue remains and that is adequate sample size. This will become an issue for distribution fitting once soil ingestion rate is addressed but it is not an issue for representativeness.

Empirical data on adult soil ingestion rates from the Calabrese study conducted in 1990 are being used as a starting point for soil ingestion rates. This mass balance study was used to verify the tracer mass balance methodology used in a study of the soil ingestion rate of children. Eight trace elements were measured in 64 children aged 1 to 3 over a 7 day period. Participants were selected from a stratified random sample of 200 households. The probability distribution developed for probabilistic risk and RSAL calculations is based on the truncated lognormal distribution defined by four parameters:

- 1 Arithmetic mean (47.5 mg/day)
- 2 Standard deviation (112 mg/day)
- 3 Minimum (0 mg/day)
- 4 Maximum (1000 mg/day)

Susan further reviewed the parameters and described that the decisions will be made based on conservative risk analysis resulting from the ingestion rates exposure frequencies and exposure duration outputs.

A concern regarding the conversion of soil ingestion from milligrams per day to grams per year used by the RESRAD model was voiced. Susan further described the

probabilistic risk assessment process which includes a range of distributions from 0 to 1 000 mg/day The model will pick up different points on the curve based on thousands of repetitions

Joe Goldfield commented on the small size of the sample population studied by Calabrese plus the fact that the probability distribution was based on daily ingestion but is being modeled as an annual intake rate resulting in data that are justified by the behavior of the curve only Susan stated that during the risk assessment process distribution of risk is used to make management decisions The curve is an information tool and will aid in assigning conservative vs nonconservative judgments about available data

Reed added that the challenge is not the range of soil ingestion values but the task of picking out the appropriate points on the curve and applying those in the calculations

Susan finalized the discussion on soil ingestion rates for children by stating that the 1997 Calabrese study in Anaconda Montana will be used because it is geographically similar to the Rocky Flats Site This study used a tracer approach to eliminate any source errors so for the purposes of the study the RSALs Working Group has only looked at the rare earth tracer elements that eliminate source error Final soil ingestion estimates are based on soil particle size of <250 microns

In terms of soil ingestion for adults there are less data There exists a 1990 study from the University of Massachusetts that can be used to fit distributions for the Rocky Flats study but there is discomfort in the fit of data to the lognormal distribution Since there is not a true soil ingestion study for adults a point estimate may be used This point estimate for risk assessment was developed by EPA and provides for standard default inputs The standard default input for residential adults and wildlife workers is 100 mg/day

The Focus Group deliberated on the appropriateness of the point estimate standard and called for further review on the validity of existing studies For the purposes of the Rocky Flats study data were evaluated using the Calabrese and Amherst studies and added the very high results from the Holly study According to Susan the scientific community has embraced the Calabrese studies as the best out there to date

Other comments from the Focus Group follow

- The small sample size of 6 individuals (Calabrese study) may cause enormous errors
- Mass loading must have an effect on soil ingestion

- The risk across all pathways (ingestion and inhalation) is cumulative
- There is an inhalation risk when calculating soil ingestion
- The statement Sample size was not a factor for evaluating representativeness violates the principals of statistical sampling
- It is possible for a small data set to represent another similar population
- Additional web research must be conducted on soil ingestion rates and
- The soil ingestion rate for adults should be peer reviewed

OTHER QUESTIONS POSED BY THE FOCUS GROUP

Plant Uptake

Bob Nininger of Kaiser Hill stated the plant uptake calculations in the RESRAD model are maximized meaning that the model calculates risk values based on total immersion of the plant in plutonium and americium contaminated soil Surface dilution and resuspension are not considered rather a soil bulk value was used for mass loading which is slightly higher than surface contamination

Algae and Downstream Water Sources

According to Bob modeling efforts do not consider migration of plutonium and actinide from the ponds to an offsite location As it stands exposure from the ponds is much lower than an onsite worker being exposed to plutonium from multiple pathways CDPHE stated that surface water standards may be difficult to understand since it is not completely clear how to assign risk values to dissolved plutonium Studies will continue to be evaluated to form the basis for management decisions

Surface water going offsite is not a part of the RSAL calculations It is a separate issue and needs to be dealt with

The Focus Group agreed that several topics were still pending including

- Mass loading
- Exposure frequency
- Exposure duration
- Modeling methodology and
- The need for a wind tunnel presentation

The group discussed the wind tunnel studies A decision was made to establish a peer review process of the wind tunnel project Reed stated he helped design the wind

tunnel and wanted to abstain from choosing the technical experts for peer review The Focus Group concurred

It was decided that a review group would meet with Christine Bennett Facilitation Administrative Process to discuss potential peer reviewers for the wind tunnel studies

Final comments included the schedule for the Task 3 report The report still needed peer review and the 45 day public comment period The report should be available for public comment in November 2001 Additionally further characterization of under building contamination and old process wastelands is underway Preliminary results have been published on Buildings 886 123 and 771 Kaiser Hill will continue to conduct a detailed investigation while providing adequate documentation

ADJOURN

The meeting adjourned at 6 40 p m

**Participation List for
RFCA Focus Group Meeting of 09/05/01**

First	Last	Company	Organization
David	Abelson	RFCLOG	
Melissa	Anderson	RFCLOG	
Christine	Bennett	AlphaTRAC Inc	
John	Ciolek	AlphaTRAC Inc	
Rick	DiSalvo	US DOE RFFO	
Shirley	Garcia	City of Broomfield	
Joe	Goldfield	RFSALOP	
Steve	Gunderson	CDPHE	
Mary	Harlow	City of Westminster	
Jerry	Henderson	RFCAB	
Reed	Hodgin	AlphaTRAC Inc	
Victor	Holm	RFCAB	
Jeremy	Karpatkin	US DOE RFFO	
Ann	Lockhart	CDPHE	
Carol	Lyons	City of Arvada	
Tom	Marshall	Rocky Mountain Peace and Justice Center	
LeRoy	Moore	RMPJC	
Diane	Niedzwiecki	CDPHE	
Tim	Rehder	US EPA	
Carla	Rellergert	Weston	
Kathleen	Rutherford	CDPHE/HMWMD	
Mark	Sattelberg	US Fish and Wildlife Service	
Kathy	Schnoor	City of Broomfield	
Dave	Shelton	Kaiser Hill Company LLC	
Carl	Spreng	CDPHE	
Noelle	Stenger	RFCAB	
Honorable Hank	Stovall	City of Broomfield	

RFCA Stakeholder Focus Group

September 5, 2001

Meeting Minutes

INTRODUCTION AND ADMINISTRATIVE

A participants list for the September 5 2001 Rocky Flats Cleanup Agreement (RFCA) Stakeholder Focus Group meeting is included in this report as Appendix A

Reed Hodgins of AlphaTRAC Inc meeting facilitator reviewed the purpose of the RFCA Stakeholder Focus Group and reinforced the meeting rules Introductions were made

AGENDA

Reed reviewed the agenda

- Briefing on New Results in the RSAL Modeling Matrix
 - New modeling results
 - Sensitivity of results to key input parameters
- RSALs Task 3 Continued Technical Discussion
 - Mass loading questions
 - Exposure frequency and duration
 - Safety factors and conservatism
 - Other technical questions from question list
- RSALs Task 3 Continued Technical Discussion
 - Soil Ingestion Rate
- Frame the Policy Discussion for Next Focus Group Meeting

BRIEFING ON NEW RESULTS IN THE RSAL MODELING MATRIX

Tim Rehder U S Environmental Protection Agency (EPA) stated that there were no new results to present on the Radioactive Soil Action Level (RSAL) modeling matrix Susan Griffin EPA will continue work on it and anticipates releasing the results within ten days

Steve Gunderson of the Colorado Department of Public Health and Environment (CDPHE) stated that the RSALs Working Group is compiling written sections for the Task 3 report and is targeting a deadline of September 7 2001

RSALS TASK 3 CONTINUED TECHNICAL DISCUSSIONS

The group engaged in a question and answer session on the following topics

- Mass loading and
- Exposure Frequency and Duration

Mass Loading Discussion

Questions on the following topics were discussed with Kaiser Hill Company LLC CDPHE and EPA providing technical responses

- Standards for resuspension
- Frequency of fires
- Peer review of wind tunnel technology
- Variations in particulate concentration
- Values for mass loading and
- Soil ingestion input values

Standards for Resuspension

Jerry Henderson of the Rocky Flats Citizens Advisory Board (RFCAB) asked if a sophisticated dust resuspension model was being developed for the actinide migration evaluation work and if so could it be used to benchmark the RSAL results for the inhalation pathway

Bob Nininger of Kaiser Hill Company LLC stated that the actinide migration evaluation was making progress this year and in the short term the model was using Industrial Source Complex (ISC) inputs and inputs from the wind tunnel study along with other inputs to develop a future scenario model for Rocky Flats These data are not considered benchmark data but may be used for informational purposes Probability distribution functions (distributions) were developed for the RSAL based on a median value from statewide data From there distributions were modified to include the effects of precipitation the post effects of fire and seasonal implications These data will be compared to the data points currently being generated for the RSAL Additionally data from the wind tunnel study seemed to be the best resuspension data

available for Rocky Flats Again full distribution data will not be available from the actinide migration evaluation

Frequency of Fires

LeRoy Moore Rocky Mountain Peace & Justice Center (RMPJC) asked for an explanation and rationale for the methodology used for the frequency of a major grass fire at Rocky Flats in comparison to the approach used by the RAC ^a

Bob Nininger Kaiser Hill reminded the Focus Group that when dose calculations were being developed the timeframe was based on one year Distributions were then used involving some of the variables of that particular exercise From there the frequency was established at the 95th percentile The dose calculations that correspond to the mass loading in the fire scenario were evaluated at the 95th percentile It is not believed that this approach differed from that of the RAC

Peer-review of Wind Tunnel Study

LeRoy Moore of RMPJC inquired about the wind tunnel study and the reliability of the results since its methods of measurement and calibration have not been peer reviewed RMPJC wanted to know what the course of action is if the peer review recommends major changes or if the peer review concludes that the wind tunnel technology cannot produce reliable data for RSAL calculations

Bob Nininger of Kaiser Hill briefly reviewed the actual events of the wind tunnel study The first data were collected the day after the test burn in the southwestern buffer zone and emission rates were evaluated Next at some other point in time data were collected from the same general area that was only naturally disturbed Nearly one month later another emissions test was conducted Analysis of these three data sets can reveal the recovery behavior after a burn The author of the wind tunnel study Dr Chatten Cowherd Midwest Research Institute developed mathematical curves to further evaluate erosion potential as the surfaces regrow These calculations include weather conditions seasonal differences and the effects of non revegetation These are variables considered as part of the distribution of mass loading

Reed Hodgkin facilitator added that the peer review process is underway Four peer review candidate names have been submitted thus far

A Focus Group member suggested that there were several technical issues that needed to be addressed with regard to the wind tunnel study These issues ranged from the

characteristics of the duct used in the study to the volume time and velocity of the material being transported

CDPHE defended the study and the fact that Dr. Cowherd had a solid international reputation. Additionally, John Ciolek, citizen, stated that when studies are eligible for peer review, it is because the study possesses credibility.

Some questions relating to this study were answered during an RFCAB session. Reed suggested the participants read the study in detail, review the notes from the RFCAB session, and revisit how the wind tunnel study can contribute to the additional resuspension that occurs with fire scenarios.

Variations in Particulate Concentration

John Ciolek, citizen, asked about diurnal variations in particulate concentration and if the exposure scenarios accounted for the increased concentrations that occur when the receptor is exposed.

The issue is one that relates to averaging both day and night time data, which will reduce concentrations because, ostensibly, concentrations will be much higher during the day when there is more activity as opposed to lower activity nights.

Bob Nininger of Kaiser Hill stated that this study has not directly looked at day and night differences in particulate concentrations. EPA added that this study assumes mass loading remains constant throughout the site, meaning that the content in the soil is constant throughout the site. The RAC modeled plutonium in air concentration based on historical meteorological data. The 903 Pad and the lip area to the east of the pad are of particular importance because there are areas that have concentrations of hundreds of pCi/g. Area source concentrations fan out from the 903 Pad and the lip area according to the modeling results.

John requested a report back on the difference between day and night time concentration data and how the difference contributes to the total dose.

Values for Mass Loading

John Ciolek, citizen, wanted to understand why higher averaged values were dismissed while developing the seed value for mass loading.

John further added that the value is contained in the wind tunnel study yet the data from Colorado's sampling network were used and averaged

According to Bob Nininger of Kaiser Hill the five state samplers around Rocky Flats were used to determine Rocky Flats concentrations. The seed value was established using all of Colorado's data for a given period available in the AIRS database. A median value was identified (50th percentile) and a distribution around the median value was calculated. There is no evidence that a better distribution would have been available than the approach of using site specific data against the AIRS database seed value. An appendix in the Task 3 report will further speak to this issue.

John and Bob further discussed the statistical representation of annual average values. The AIRS data demonstrates a spread of $\sim 10\mu\text{g}/\text{m}^3$ to $\sim 51.56\mu\text{g}/\text{m}^3$ which is above the annual average standard of $50\mu\text{g}/\text{m}^3$ for PM¹⁰. Averaging the concentration data for a year at a particular Site derives this annual average. With this in mind $26\mu\text{g}/\text{m}^3$ was used as a median value for the distribution. These site specific data were used to generate the distribution based on the median value of $26\mu\text{g}/\text{m}^3$. As a note the Site's median value was $11\mu\text{g}/\text{m}^3$ and the Site's highest value was $\sim 17\mu\text{g}/\text{m}^3$ so the distribution is designed conservatively.

Soil Ingestion Input Values

John Ciolek, citizen, inquired about the maximum value of 100 mg/day for adult soil ingestion used in the Monte Carlo simulation when the mean and median values in the Calabrese 1990 study are equal to or greater than 100 mg/day.

EPA pointed out that the study was not used due to the small sample size and that EPA uses 100 mg/day as a reasonable default if site specific data are not available. The 100 mg/day is used at all Comprehensive Environmental Response Compensation and Liability Act (CERCLA) sites and is a policy level default. It was further noted that the Calabrese study was actually a calibration study for the child soil ingestion rate.

John further inquired about topsoil disturbance and an enhancement factor. He explained that some studies indicate that when topsoil is disturbed, plutonium in resuspended soil increases.

Bob Nininger of Kaiser Hill stated that there was slightly higher radioactivity in disturbed burned topsoil than in undisturbed burned topsoil yet the top surface actually experienced deposition of clean material on a burn area which actually may require a reduction factor rather than an enhancement factor. A reduction factor was

88

not considered in relation to emissions from the disturbed burn area This reduction factor may well be around a 20 to 30% reduction but the mass loading in the RESRAD model was not modified to reflect this

EXPOSURE FREQUENCY AND DURATION DISCUSSION

A total of six questions about exposure frequency and duration were discussed with Kaiser Hill CDPHE and EPA providing technical responses Questions were presented on the following topics

- Duration for wildlife refuge worker
- Exposure frequency and duration conservatism
- Safety factors
- Sensitive parameters and conservatism
- RSAL and dose and
- Source parameter

Duration for Wildlife Refuge Worker

LeRoy Moore RMPJC asked what the assumed annual time onsite for a wildlife refuge worker is and what duration of time will the worker be outdoors

CDPHE responded that the duration is evaluated based on 200 to 250 days per year 200 days assumes a 50 hour workweek four days a week and 250 days assumes 50 hours with a five day workweek The model assumes that 50% of the time is spent outdoors which is based on a Rocky Mountain Arsenal survey of outdoor workers In terms of the duration values range from zero to 40 years with a mean value of 7.1 At the 95th percentile duration is 14.8 years These data were gathered from a study commissioned by the Rocky Mountain Arsenal which included different wildlife refuges around the country

EPA stated that these distributions are to be considered average not maximum total distributions

Reed Hodgins facilitator clarified the point by stating that distribution is based on the results of all the calculations from all of the parameters combined

Mark Sattleberg US Fish and Wildlife Service stated that the arsenal studies have been reviewed and the distributions were found satisfactory

Exposure Frequency and Duration Conservatism

Jerry Henderson RFCAB wanted to know if less conservative values were being used for exposure frequency and duration than for less important parameters and if so why

Jerry further stated that important parameters such as mass loading, are conservative due to the approach (using statewide and site specific data) and the approach to temporal parameters such as exposure frequency and duration may be less conservative

Kaiser Hill stated that the distribution for exposure frequency and duration for the wildlife worker is better known and can more precisely be characterized

EPA said that the primary focus is to develop a technically defensible risk assessment and to separate risk management from risk assessment Where conservatism is concerned the standard of reasonableness is applied As a result the degree of conservatism is reflected in the confidence one has in any given parameter and its sensitivity

Mark Sattleberg US Fish and Wildlife Service commented that the duration of a refuge worker is perhaps four to seven years due to the high turnover rate

The Focus Group further discussed how worst case assumptions would be perceived and how regional differences in mass loading relatively compare to localized differences in mass loading Bob Nininger Kaiser Hill stated that as a result a factor of 20 conservatism is built into the model taking into account exposure frequency except for the resident scenario

The City of Westminster stated that it is not unreasonable to request the most conservative risk assessment

The Focus Group also discussed the potential distinction between plutonium concentration in the air and in the soil Studies of resuspended aerosol in the Chernobyl area have found that there was enrichment of radionuclides on resuspended particles compared to soil Kaiser Hill stated that there existed a 1:1 ratio of plutonium concentration in air and soil based on site specific data The RAGS and RESRAD use this 1:1 assumption

Safety Factors

LeRoy Moore of the RMPJC asked if calculations used safety factors to account for uncertainties and limited knowledge in the modeling process. If so, what factor is used and how is it used in the calculation? If not, what is being done to account for the uncertainties and for what is not known?

Victor Holm, RFCAB, stated the Interstate Technology Regulatory Commission (ITRC), which is made up of state regulators, routinely set action levels conservatively. A report is being issued soon that evaluates risk assessment and the unbiased scientific approach, which does not build in conservatism. Conservatism speaks to risk management, which looks at safety factors.

EPA sets standards that protect at a reasonable maximum exposure at the 90th to 95th percentile.

Safety factors are considered after the calculations have been conducted and a distribution established. The safety factor is set at the 95th percentile or 10^{-4} or, due to further uncertainties, a safety factor of 10^{-5} or 10^{-6} may be used. Managing risk basically involves picking within the risk range and then selecting the percentile from a probabilistic outcome. Safety factors are implemented during risk management, not during risk assessment.

Sensitive Parameters and Conservatism

LeRoy Moore of the RMPJC wanted a detailed explanation as to why the most conservative approach is or is not being taken for each of the most sensitive parameters. Further, he wanted to know if the differences could be shown between the most conservative approach across the board and any other approach. Additionally, Leroy wanted to know what is meant by an unrealistically conservative result. Leroy also asked how the agencies have decided to counter the conservative tendency for particular parameters, what counter measures have been taken, and how the decisions were made regarding parameter selection for counter measures.

EPA reiterated that a conservative, technically defensible calculation is the task at hand. A worst case scenario for every parameter results in hyper conservatism and criticism that worst case scenario development is contrary to EPA guidance. Further criticism will include that one has not followed proper risk assessment methodology, which will result in rejection.

The Focus Group further deliberated the intent of the conservative approach the risk assessment and how and when it is applied EPA commented that the Task 3 report will include a discussion on all of the parameters and the rationale for declaring a distribution based on realism

RSAL and Dose

John Ciolek citizen asked that the assumptions be explained when establishing dose at 25mrem/yr for the RSAL

EPA stated that it calculates the dose using the sum of ratios method

Kaiser Hill stated that the dose correlates with the input parameters This can be done as a deterministic sub data or can be input as a distribution For example a distribution would be evaluated at the 95th percentile Mass loading uses the distribution method

The Focus Group deferred the question and asked for a response from the regulatory community at a later date

Source Parameter

John Ciolek citizen asked why the source is not a temporal parameter

Kaiser Hill explained that the intent was to analyze the future and that that source was being treated as a temporal parameter

Kaiser Hill further discussed the half life of the sources in question (plutonium americium and uranium) and the decay chain resulting in daughter products Kaiser Hill stated that the maximum ingrowth of americium into weapons grade plutonium has been potentially reached whereby exponential decay will follow For the purposes of this study modeling has only been conducted to 1000 years

FRAME THE POLICY DISCUSSION FOR NEXT FOCUS GROUP MEETING

The Focus Group discussed and listed policy questions which include

- Top down or bottom up approach?
- What is acceptable risk to the agencies and to the public?

- What is the process for picking the risk level?
- How does ALARA fit in?
- What is the right scenario to base the RSAL on?
- Should tiers be established?

Reed commented that the scenarios have already been established

WIND TUNNEL PEER REVIEW PLANNING MEETING

AlphaTRAC was asked to coordinate a meeting with volunteers to plan the wind tunnel peer review

ADMINISTRATION

The Focus Group decided to cancel the 10/31/01 RFCA Focus Group meeting The principals meeting is still scheduled for 10/30/01

ADJOURN

The meeting was adjourned at 6 30 p m

RFCA Stakeholder Focus Group
Attachment D

Title	RSALs Working Group Meeting Notes for February 7 2002
Date	February 8, 2002
Authors	Sandra MacLeod
Phone Number	(303) 966-3367
Email Address	sandra macleod@rf doe gov

NOTES FROM RSALs WORKING GROUP MEETING ON 2/7/02

ITEMS COVERED ON 2/7

- 1 Discussed uranium dose and risk calculations
- 2 Discussed Task 3 response to comments

ACTIONS

Action Item	Who	When	Notes
Complete Task 3 response to comments table with responsibilities assigned	Mark Aguilar	2/8/02	
Get PR ready and deliver to Susan	Mark & Jean	2/14/02	About 5K should cover this
Talk to Phil Newkirk re IRIS RFD does not consider GI absorption but slope factor does Should we consider it for RFD?	Jim Benetti	2/8/02	
Talk to Phil Newkirk re adult cancer slope factors for Pu Am & U	Jim Benetti	2/8/02	
Revise last paper to add explanation of why a distribution was developed for plant uptake	Jim Benetti	2/8/02	
Find out Tom Pentecost s availability	Carl Spreng	2/14/02	
Start preparing assigned responses to comments	Workgroup Assignees (see Mark s table)	2/21/02	
Bring list of those comments that will result in a change to the text of the Task 3 report or to the calculations	Workgroup Assignees (see Mark s table)	2/21/02	
Prepare Focus Group presentation on uranium risk calculations	Susan Griffin	2/20/02	Bob Nininger & Carl Spreng will assist with small area/hot spot calculations

DECISIONS

- 1 Use RFD in IRIS for uranium (for non cancer effects)

**NEXT MEETING THURSDAY, 2/21/02, 8 30 a m , at Rocky Flats,
B060**

Agenda Items

- 1 Discuss response to comments table and add note for those comments that will result in a change to either the text of the report or the calculations
- 2 Discuss responses that have been developed
- 3 Discuss any changes to calculations